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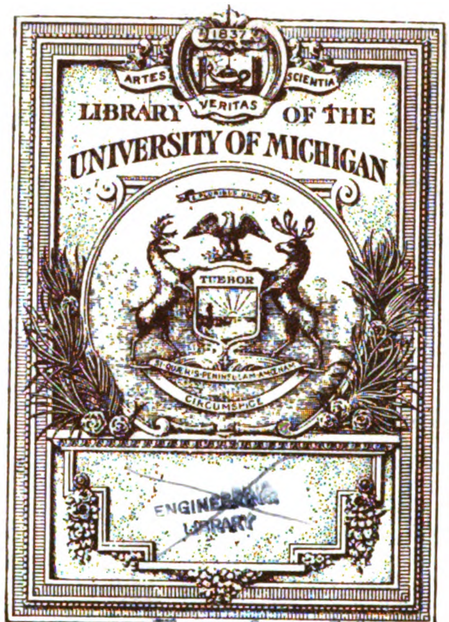

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

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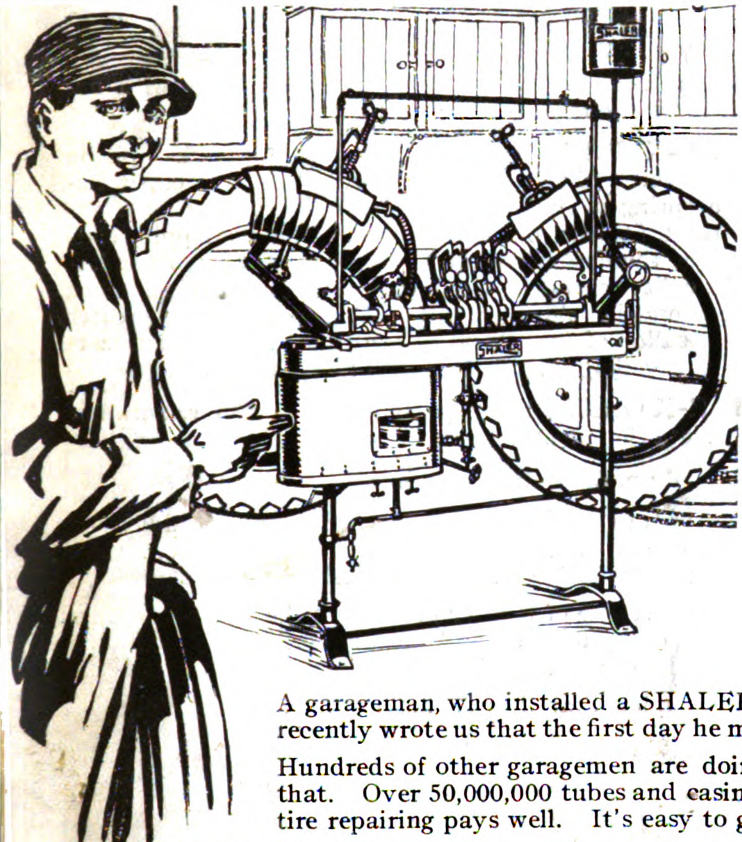

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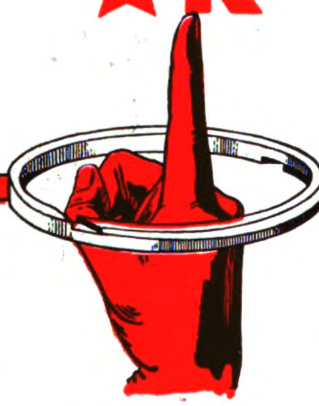

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MISHAPS *will* HAPPEN

Compiled by the Editor

Comics and Ornaments by Jatt

I THINK it was Mark Twain who remarked, after reading over a patent-medicine advertising booklet, that he had every one of those symptoms except "house-maid's knee." After you have been in an automobile accident and have been haled into court you will realize that you have committed every crime on the calendar and I doubt if there is an exception as in Mark Twain's case.

I once thought that accidents quite naturally fell into two classes, those in which the party of the first part inflicted greater damage upon the party of the second part and those in which conditions were reversed, but mature consideration leads me to believe otherwise. There is but one classification of accidents, and into this class fall those for which you *pay*. If you don't have to pay, then it isn't an accident. There are sub-classes and sub-divisions in the one classification, but the thing always resolves itself into dollars and sense; your dollars and the other fellow's sense.

Lest my readers get the idea that I wish to be flippant regarding a subject which should be treated seriously, I might explain that this article will treat only upon those accidents which do not result in loss of life or injury to persons. When one steps into a puddle of icy water, the circumstance has a comic side, but if that person contracts pneumonia, then there is nothing funny about any part of it. There are enough comical things to furnish food for thought so that we need not make light of those accidents which are far from the humorous.

An accident is always instructive and avoidable. Your car may skid on an icy pavement and be damaged badly but you are taught a lesson and the next time you drive over an icy pavement you put on the chains. Your car may bump into the one ahead and cost you considerable time, money and worry before the damage is repaired. Perhaps your brakes did not work, perhaps you were talking with a passenger and did not see the signal from the man ahead, but the accident was avoidable and you vow that it will not happen again if your diligence can prevent it.

I said that every accident is avoidable, which was rather a bald statement of a fact. Possibly you cannot prevent some accidents, but every accident may be prevented by someone, and after all we should work for safety in motoring either personally or through our road laws.

Were we to compile data on all of the accidents which occur we might gain many valuable lessons. We would find, probably, that the majority of accidents were caused by either of the following: Carelessness or neglect on the part of the driver; ignorance or disobedience of the law; mechanical failure of some part of the machine, and bad roads. In the latter classification of bad roads, I would include curves which are not marked by signs, excavations unprotected or unmarked and roads which are too narrow for safety. Study these various classes and you will find that the motoring public as a body can prevent a majority of the automobile accidents which occur.

Since I have made this classification I will consider each item in the order it has been given above. A greater number of accidents are caused by carelessness than by anything else and it is unfortunate that the careless driver is not the only one who suffers the consequences. If every neglectful, thoughtless and careless driver personally suffered from the accidents he caused, and if he suffered severely each time he caused an accident, the roads would be more safe for all of us.

* * *

"What a wonderful view," said Mrs. Winther, as their car rounded a sharp curve, on a downward grade. "Let's stop here and take some pictures." The car was stopped at the side of the narrow road and the family admired the scenery for a few minutes. They watched a heavy truck

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pull up the hill, working at low speed. Just as the truck drew alongside, a heavy touring car, running at 25 or 30 miles an hour, appeared around the corner. It was humanly and mechanically impossible for the driver of the touring car to bring it to a stop; it was just as impossible for the truck driver to get out of the way and the Winther family were obliged to admire the view from the side of the road through dazed eyes; their car was nothing but a memory. Don't stop your car on "blind" corners!

The long string of cars ahead of the Ford were jogging along at 15 miles an hour. Henry Jones, the Ford driver, was in a hurry and growled to himself against the slow pace. At the next steep hill he "gave her the gas" and overtook the car ahead; another notch and he had passed it only to find that he could not work into the procession because the cars were running fairly close together. In order to keep the advantage he had gained he held his position, when, directly in the road ahead, appeared another Ford car, coming toward him. Now Jones realized that he was on the wrong side of the road, and he realized that he would have a lawsuit on his hands if he bashed the Ford ahead, so he did the only obvious thing—he forced his way into the string of cars. He bumped the man ahead, and the man behind bumped him; all three cars involved went into the ditch and another "unavoidable" accident was added to the list. Don't cut-out on hills or curves; wait until you are sure you can pass the man ahead and get back to your own side of the road!

"Smith Admits That He Is As Wonderful Driver as They Make 'em."

Henry Smith is a "dare-devil" driver and admits that he can put it all over anything on the road. Since an accident last week, he has amended his statement to the effect that he supposes there are drivers who are able to put his little car into the discard. Henry has, or had, an evil habit of driving like the old nick right up to the corner where he desired to turn, then he would apply both brakes, hold out his hand and make the corner on two wheels.

Last week he tried that same little stunt and a big, heavy Locomobile caught up with him at a corner, pushed him into a brick wall and tangled his little flivver up so badly that even the junk dealer admitted the case was hopeless. The speed of a light car can be reduced very quickly from 35 miles an hour to 10, but a heavy car cannot be braked so easily. Just remember this fact and govern yourself accordingly.

One Careless Driver Involves Others

We could go on for many pages and give hundreds of illustrations showing the various careless ways in which wrecks could be caused. It is safe to say that a big majority of accidents are due to carelessness; the driver is so confoundedly selfish that he doesn't think of the other fellow. The proportion of selfish drivers to the actual number of car owners is extremely small, but one careless driver can involve many others, without suffering himself.

Ignorance often causes accidents and in the last analysis the man who takes his machine out on the road without knowing how to operate it, or the principles which govern its operation, is just as careless and selfish as the fellow who aims a gun at a friend and pulls the trigger with the idea that "maybe it isn't loaded."

About a month ago the train in which I was riding hit an automobile and since we were going at least 40 miles an hour the train made mincemeat out of that machine. The car belonged to one of my fellow townsmen and I made a point of investigating the circumstances which resulted in the accident.

For convenience we will call the man Mr. Black. Mr. Black had been a car owner for about a week and was not familiar with his machine beyond the fact that a certain lever should be pulled toward him at the same time a pedal was pressed, in order to start the car. Some one had told him that he must apply the emergency brake when he left the car, else some mischievous small boy might start it again. Aside from knowing which way to turn the steering wheel and how to work the gas lever, Mr. Black was rather in ignorance.

With this slight amount of education, Mr. Black drove forth in search of a conquest. As an admiring audience he took his wife, a six-month's-old infant, and his eldest son, a boy of twelve. The first thing Mr. Black looked for was a nice railroad crossing; he wanted to show the world that he could encounter one and put his car all over it without getting into trouble.

And At Last He Found That Crossing

He drove several miles before he found a crossing to his liking, but when he found it, he did himself full justice. The crossing is half-way down a hill and hidden behind a big clump of bushes. It is almost impossible to stop a car on the track because the grade is so steep, but Mr. Black was able to do it. He gave his wife and family an illustration of a car being stalled on a crossing and to make it more interesting he looked down the track and in the distance he saw a train approaching.

Just then Mr. Black forgot the correct thing to do. He couldn't seem to remember which button to press or which lever to move and he intimated this fact to his family; then he suggested that they leave the car immediately and for a short time until he collected his thoughts.

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One thing was uppermost in his brain:—"Never leave your car without setting the brake." Mr. Black set the brake, opened the door, alighted from the car and with his brood waited for the train to arrive. If he had not set the brake the car might have escaped, but as it was it suffered a speedy and complete demolition, and my train was delayed for half an hour while our engineer picked pieces of the carburetor out of his cow-catcher and plates of the storage battery out of his teeth.

Mr. Black, in talking of the accident later, said that the reason why he set the brake was to prevent the car from rolling down the hill and smashing itself upon the stone wall at the bottom. I will leave it to the reader to judge as to the wiseness of Mr. Black's decision.

If ignorance of driving principles and car mechanism is unpardonable, then ignorance of the law is criminal neglect on the part of the car owner. If the driver is fortunate and is able to navigate his car on the roads for a few weeks without an accident he learns enough about driving in that time to be fairly proficient and ceases to be a menace. When he is accustomed to driving, his hands and feet automatically do the work and he seldom needs to depend upon his brain in an emergency.

Disobedience Is Inexcusable

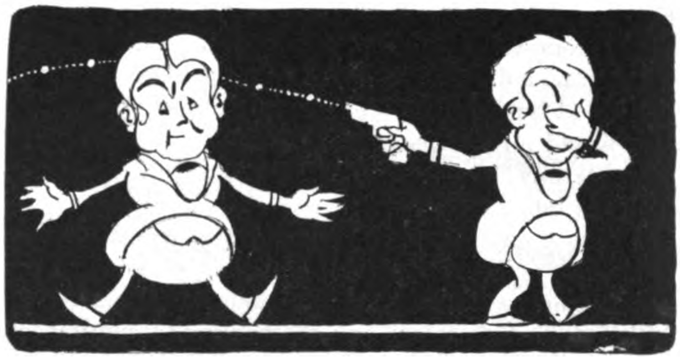
Despite the fact that his hands and feet act for themselves, the driver cannot be excused if he disobeys the law, as many of them do. I have often wondered why some drivers insist upon driving their cars on the left side of the road. Ask one of these men why he prefers the left side of the road and he will tell you that the street on that side is smoother. It doesn't matter a bit where he is or in which direction he is going, the left side seems always the best.

"Then They Admired the View from the Side of the Road, Through Dazed Eyes"

A short time ago, in one of our eastern courts, a case was tried in which the circumstances pointed to the fact that the "left-side" driver was blamable, but a verdict was handed down in his favor. The whole case is worth review here because it contains two big lessons from which our readers may profit.

We will give the facts as they appeared to us, not as the actual legal evidence showed. For convenience we will call one of the drivers Mr. Law and the other, Mr. Lefty. Mr. Lefty is the man who makes a practice of driving on the left side of the road, when he feels that he can do so without getting caught.

The first lesson to be learned and profited by is wrapped up in the fact that Mr. Lefty always carries a small camera with him in his car. He claims that the camera



"—Who Aims A Gun at His Friend and Pulls the Trigger with the Idea That 'Maybe It Isn't Loaded.' "

is almost as good as insurance because with it he can secure any evidence in case of an accident. His judgment was proved an excellent in this particular case.

Mr. Lefty, we assume, was driving on the left side of the road as usual, and at a fair rate of speed. His usual average was 40 miles an hour when he wasn't really in a hurry. He had reached a point on the state road where there was a sharp curve, hidden by a big signboard, when from the opposite direction appeared Mr. Law in his car. Mr. Law was on his right side of the road, in other words, the same side as Mr. Lefty.

There was no time for brains to act, no time for skill and the cars were so close together that neither could have been driven to the opposite side of the road.

Mr. Lefty knew that he was in the wrong and did the only thing to rectify his error, he was traveling at, perhaps 35 miles an hour, and turned toward the center of the road to reach his own side. But Mr. Law did not know what would happen, he realized that he was in the right, but that someone else was on his side. Mr. Law decided that he could avoid trouble only by turning his car to the left and the two cars met at the center of the road. Unfortunately the crash occurred slightly to one side of the center, however, and the side was at the right as related to the direction of Mr. Lefty's travel.

Mr. Lefty was the first to regain consciousness, somewhat battered, minus two teeth and with a broken arm, but otherwise alive to the facts. He crawled to his car and found the camera beneath the back seat. He crawled back and secured an excellent picture of the wreck, and this picture, substantiated by the testimony of witnesses proved that the accident occurred on his right side of the center.

Mr. Law told the story about as we have told it and yet it was obvious that he could not produce any tangible evidence to support it and so he lost his suit for damages.

Where our laws are plain and clear there is no excuse for bisobeying them and for our self protection, the protection of all law abiding motorists, we should try to have the laws enforced.

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When someone wants to give an impressive illustration of a fact, such as the number of pennies spent for daily newspapers or the amount of paper used in cigarettes they say that if those pennies or ciggarette papers, or what not, were placed end for end, or side by side they would form a line from New York to somewhere between Chicago and Canton, China, or to the Moon. Following this custom we might say that if all of the battered headlamps from automobiles which are bumped because someone didn't hold out one's hand, were placed side by side they would form a chain reaching from now to five years after eternity. And we feel that we are entirely conservative in our statement.

I have always contended that when a man causes an automobile accident and is haled before the bar of justice for breaking a law, the judge should temper his verdict with mercy if there are any extenuating circumstances. But if that same man ventures to say that he didn't know the law, or forgot about that particular law, then should the judge invoke all of his power and treat that man as he deserves. That man should have his driving license taken away, he should have his car reduced to a pulp beneath a steam-roller, he should be centenced to life at the stone-pile and then buried in quick-lime or some other unpleasant medium. There is no excuse for not knowing the automobile road law.

I doubt if more than one in every hundred accidents is caused by mechanical failure of some vital part of the automobile, by this I mean the breakage of a part. Many are caused by improperly working brakes and stiff steering gears and all such accidents are preventable.

The car owner should make a practice of keeping the brakes in order. The law specifies two braking systems and in some States it specifies just how effectual these brakes must be. The owner must realize that he is intrusted with a machine far more dangerous than a gun and that he has no more excuse for saying that the brakes did not work than for saying, after killing a friend with the gun, that he didn't know it was loaded.

Braker, running gear, steering gear, leakages, wheels, lights, signals, etc., and so on should be kept in condition at all times and should be given a careful examination once a week if the car is used regularly.

I think everyone will agree that all of the accidents so far mentioned are in the "avoidable" class because they are all due to human fallibility and carelessness. As long as there are automobiles there will be accidents, but the automobiles will be the innocent instruments of careless and thoughtless people. Only by doing our best to keep within the law and by using our brains can we decrease the number of accidents.

The motoring public has done much to eliminate the last class of accidents, those caused by bad roads, hidden curves and dangerous crossings. The "Good Roads" movement is spreading daily and within a few years we will have a network of excellent roads all over the country. Those of us who have political influence should exert it in an endeavor to make the roads of a proper width.

We can do our part in having warning signs placed at crossroads and at railroad crossings. We can insist that the road commissioners properly mark excavations and points where road repairs are being made.

Only by obeying the law ourselves and exerting our influence toward making our neighbors obey the law can we hope to reduce accidents.

A NOVEL PROTECTOR

RAILROAD passes, building and plant passes, membership cards, automobile and drivers' licenses, authorizations of various kinds and many other similar articles, which are generally made of paper and have to be shown frequently, become bent, broken, torn and dirty from handling and carrying about in the pocket. They are generally carried in leather or imitation leather cases and the face of the pass is shown through a transparent cover.

An ingenious substitute for the more or less cumbersome leather case is made by cementing the card between two pieces of transparent sheeting. This can best be done by spraying the pieces of sheeting with a solution of one-third wood alcohol and two-thirds amyl acetate and after allowing them to dry for about ten minutes, to avoid blurring the ink, placing the card between them and uniting them by hydraulic pressure. Satisfactory results can usually be gotten in a somewhat simpler manner by coating the card on both sides with a pyroxylin solution, using a camel's hair brush, and getting the adhesion to the sheeting by means of a heated hand roller, using a piece of blotting paper between the sheeting and the roller.

The face of the pass shows through the sheeting. The card cannot be bent, torn, or soiled, and owing to the toughness of the sheeting, it is very difficult to break it. If it becomes dirty, it is easily washed. Water doesn't injure it.

Photographs or practically any flat paper surface or object can be protected in the same way. They will then stand lots of handling, carrying in the pockets, etc.

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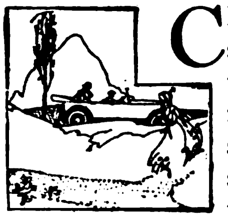
The Trend in Engine Design

Engine Development Study Continued from February

By EDWARD G. INGRAM



CRANKSHAFTS with bearings each side of every cylinder have not been used very extensively in this country in the past, but there appears to be some indication that this type of construction is increasing in favor. This type of shaft is used on the new Packard six, Lincoln and LaFayette.

The objection to the type of shaft is that the total bearing length is reduced owing to the increased number of crankcheeks, but this is somewhat offset by the fact that owing to the greater number of supports a smaller diameter shaft can be used, which reduces the linear bearing speed.

Where fewer bearings are used the tendency appears to make the shaft even greater in diameter than in the past in order to reduce vibration to a minimum. Examples of this type of construction are found in the three bearing shaft used on the 1920 Marmon, which has a diameter of 2¾ in., for a cylinder bore of 3¾ in., and the three bearing shaft of the National Sextete, which has a diameter of 2½ in. for a 3½ in. bore.

The crankshaft of the LaFayette eight is rather large for a five bearing type, being 2¼ in. in diameter for a 3¼ in. bore, yet it weighs only 30½ pounds. This light weight is accomplished by drilling out the shaft.

The seven bearing shaft of the Packard six is rather small, on the other hand, the diameter being 1¾ in. for a 3⅜ in. bore. The shaft is the result of exhaustive study and experiments and is said to be so rigid that the inevitable "vibration period" is raised far beyond the limit of even fast driving. It weighs 48 pounds, which compared to the weight of the large shaft of the LaFayette seems rather heavy.

It must be remembered, however, that it is difficult to prevent torsional vibration in the long shaft of a six and this may justify the increased weight, which is probably partly due to the peculiar egg-shaped crank cheeks used. Four bearing shafts are used on the new light six Studebaker, Paige-Continental, small Continental and Liberty-Wisconsin engines.

Few of the engines recently brought out have counterbalanced crankshafts. While balance weights reduce the load on the main bearings by preventing deflection of the shaft, they increase the mass of the rotating parts and this tends to cause the periodic vibration due to twisting of the shaft to be intensified. For this reason most manufacturers apparently prefer to reduce the bearing loads by using either a larger diameter shaft or more bearing supports, instead of adding balance weights. One well known engineer states, however, that balance weights may be desirable in the case of a very high-speed engine with comparatively small cylinders and light reciprocating parts.

From the standpoint of accessibility balance weights are also somewhat of an objection for the reason that they usually make it impossible to remove the piston and connecting rod assembly through the base of the engine. Since the diameter of the crank pin bearing is now usually made so large that the connecting rod cannot be drawn up through the cylinder after the head is removed, it is necessary either to remove the balance weights, if they are detachable, or the whole cylinder block, every time the connecting rods and pistons have to be taken out.

Cylinder Design

In the case of aircraft engines where the parts must be kept light it is usually found best to design the engine so a certain amount of weaving can take place. Freedom from vibration and noiseless operation are more important considerations than weight in the passenger car engine. Thus while separately cast cylinders are usually used on airplane engines, block-cast cylinders are used on most passenger car engines.

With the development of copper asbestos gaskets which reduce to a minimum the danger of gasket blowouts, the detachable cylinder head has come into almost universal use. A novel feature of the Liberty-Wisconsin engine is that while the cylinders are cast in a block, separate heads are used for each pair of cylinders. This is done to facilitate the machining of the combustion chambers.

The method of holding the cylinders and cylinder head by long studs screwed into the crankcase and projecting through the cylinder block, used on the 1920 Marmon, appears to have many advantages but, so far, has not been adopted by any other manufacturer. The idea is not really new as a somewhat similar construction has been used on certain motorcycle engines for some time. Experience with airplane engines would seem to indicate that the water jacket space need not be made very wide if the water circulation is good. The width of the water space used on the Liberty engine is rather small when the size of the cylinders and the fact that the engine operates most of the time at nearly maximum speed is taken into consideration, yet the engine has given no trouble from overheating.

The question of what is the proper compression ratio to use is rather perplexing. With the low grade fuels now on the market there is more tendency for the engine to knock, especially when it is laboring at low speeds

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with the throttle wide open, and this trouble can be alleviated somewhat by the use of a lower compression. On the other hand, the present fuel shortage calls for economical engines, and this favors the use of a high compression. The indications are that manufacturers will continue to use a fairly high compression. The Packard Company, for example, which has always used a rather moderate compression on its engines in the past, has made the volume of the compression chamber of the new six 21 per cent. of the total cylinder volume, which is a considerably higher compression than is used on the twelve Packard, unless this has been changed recently.

While there can be said to be no general tendency toward the use of shorter strokes, several of the latest engines brought out have what must certainly be called very moderate stroke-bore ratios. The Packard Single-Six, for example, has a stroke-bore ratio of 1 to 1.33, which compared to the Packard Twin-Six with a ratio of 1 to 1.66 is a considerably shorter stroke. The fact that the short stroke construction makes possible a considerably lighter engine is becoming pretty well understood, and it is interesting to note that the engine of the Packard Single-Six is said to be unusually light for its size. The new large Continental also has a ratio of 1.33 as compared with 1.50 for the old model.

The length of the stroke with relation to the bore for some of the other new engines follows: Studebaker, 1.40; Lincoln, 1.48; National, 1.50; Liberty Wisconsin, 1.60; LaFayette, 1.61. The average ratio for the seven above mentioned engines is 1.46.

Valve Arrangement

With regard to valve arrangements, the L-head type of engine and the overhead valve type with the camshaft in the crankcase remain far in the lead. The T-head type has practically gone out of use except for a few engines with large cylinders, most of which are now provided with double sets of valves, such as Stutz, Pierce-Arrow and McFarlan.

While the L-head type of engine is generally admitted to be the simplest and quietest in operation, and is most extensively used, the I-head engine with the camshaft in the base is gaining steadily. So far as accessibility goes, the latter possesses some advantages over the L-head type. Being on top of the cylinders, the valves, for example, are particularly easy to adjust. The long push rods are an objection from the standpoint of increased weight, but with the use of good steel the diameter of these rods can be made so small that this would not appear to be a serious objection.

The necessity for valve rockers which move through an arc, causing line contact between the end of the valve stem and the rocker arm instead of surface contact as in the case where the valve tappet comes in direct contact with the valve stem, tends to result in more rapid wear. While this no doubt is an objection, it is a surprising fact that the manufacturers of some of the latest L-head engines have introduced lever arms between the cams and the valve tappets, which introduces the line contact objected to in the overhead valve engine. The construction of course, is used to prevent the side thrust on the valve tappets, which is also a cause of noise after wear has occurred. The Packard Company claims that it is possible to make the valve action much more quiet on the Single-Six owing to this construction.

What might be called a simplification of this construction is found on the Studebaker light six. Here the valve tappets have been done away with entirely, the valve stems coming in direct contact with the bell cranks. To make the valve adjustments accessible with this arrangement the manufacturer has placed the valves at an angle of 20 degrees from the vertical which brings the ends of the stems in a position where they can be easily reached through hand holes provided for the purpose.

The overhead valve and camshaft engine, which is undoubtedly the ideal type for maximum power with a minimum weight, has made little progress in the passenger car field in this country, though a number of European manufacturers are using this type. The chief objection connected with the development of this valve arrangement is the finding of a silent and reliable means for driving the camshaft. The necessity of removing the camshaft when the cylinder head is removed is also an objectionable feature. Nevertheless, in view of the wonderful results obtained from this type of engine on both the racing and airplane fields, it is still possible that it may eventually find a place in the passenger car field.

Double valve springs to prevent vibration of the spring at high speeds are used on a number of overhead valve engines such as the Marmon and National, but the Packard six is probably the first L-head engine to be provided with double springs.

Crankcase Design

That the rigidity of the crankcase has much to do with good engine performance, is a fact now well understood, and nearly all up-to-date engines have heavily ribbed crankcases.

The usual practice of attaching the cylinders and main bearings to different parts of the crankcase so that all the stresses have to be carried through the crankcase is not theoretically correct, especially where extreme lightness is desired. A better way is to attach the main crankshaft bearings directly to the cylinders by means of long through bolts, as is done on the Trego engine. This construction was first used on aircraft engines.

From the standpoint of accessibility it is an advantage to divide the crankcase along the center line of the crankshaft as is done on the National and Studebaker engines, but greater rigidity is probably obtained when the upper part of the crankcase is carried well below this point as is done on such engines as the Continental and Packard six.

Lubrication

Because of the large diameter crankshafts now used, the linear bearing speed is fairly high even at moderate engine speeds, and this necessitates very efficient lubrication. Thus we find nearly all of the more recent engines provided with full force feed oiling systems.

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In the newer overhead valve engines such as the Marmon and National oil is even forced to the valve rockers on the top of the cylinders. The importance of maintaining an unbroken oil film in the bearings is now well understood, and transverse oil grooves which tend to break this film have been done away with. Shims have even been eliminated in the Marmon to avoid the danger of breaking the oil film. The supply of oil to the bearings is usually made so copious that it not only lubricates but also cools them. Gear type oil pumps are used on nearly all of the later engines and the oil pressure is usually controlled by a valve under spring tension which returns the excess oil to the crankcase, but in some cases the pressure is regulated by a valve interconnected with the throttle.

A B C of the Automobile

A List of Causes of Defective Carburetion Which Should be Kept

By Robert A. Chandler, S. A. E.

WE GIVE below sixteen reasons for defective carburetion:

1. No gasoline. Simple as is this trouble, it occurs occasionally to the most experience driver. It is more apt to happen if there is no gage on the tank. But what is really needed is some sort of alarm to warn the driver that the supply is low. Formerly many cars were equipped with a reserve tank so that there was always enough left to take the car to a filling station. If no gage is provided a stick, painted black, should be carried to use in measuring the depth of gasoline, but you should see that it is clean before using, as dirt, carried into the gasoline, may cause trouble in the carburetor.

2. Valve closed at the tank. Sometimes this valve closes of itself and the engine grows weaker and stops. Some valves cannot close by themselves. Find out which you have on your car and you will know whether to look there or not if the engine stalls.

3. Clogged fuel line. This is due to sediment accumulating at some part of the pipe, usually a joint or elbow, and the effect is to decrease the supply of gasoline gradually until there is no longer enough to keep the engine running. The pipe should be disconnected and blown out with a tire pump. If this fails, run a wire through it. This is considered again under the next trouble.

4. Clogged strainer. This trouble is similar to a clogged fuel line. The strainer holds back all the fluff, dust, chaff, etc., which works it way into the tank and so finally becomes clogged. As it is always set in an enlargement of the pipe it takes a long time to clog it, usually several months. For this reason the trouble comes one slowly. The dirt gradually accumulates, but as there is plenty of space around the screen, the gasoline passes through freely enough. There finally comes a time when the strainer is so clogged that it only allows enough to pass to keep the engine running at ordinary speed. As the engine is speeded up the supply lessens and the driver notices that the engine does not respond readily to the throttle. He says the engine is "slugigsh" and looks everywhere for the cause except in the right place. Then more dirt comes down, possibly dislodged from some other part of the pipe, and now only a little gasoline can pass. The engine runs for a few minutes, grows weaker, may back-fire a few times at the carburetor, and finally stops.

The driver looks over the gasoline line, finds that he has plenty of gasoline in the tank, primes the carburetor, which drips freely enough because it has had time to fill up. The driver starts the engine, which runs apparently all right, and he is more mystified than ever. But soon the engine stops again and in the same manner, growing weaker, popping back at the carburetor, and then stalling. The trouble should now be clear. No other trouble will give this peculiar effect. The engine stalls, but may be started after a moment, only to stall again. The remedy is to remove the strainer and pick off the lint, etc., or to blow out the pipe as explained above.

5. Worn float valve. Symptom: constant drip. After a long time the float valve and seat, wear out of round and so do not fit each other properly. This may be tested by removing the carburetor and testing the valve by sucking with the tongue. The valve must be ground with a special grinding material. The fine emery or carborundum used for grinding engine valves is too coarse.

6. Dirt in the valve. Symptom: constant drip. This is because a piece of lint or chaff tries to pass through the valve when it opens but is to big. It is caught by the valve, holding it open, and allowing too much gasoline to pass. This raises the float more than usual and so holds the dirt all the more firmly. The usual remedy is to prime the carburetor by the priming pin, when opens the valve wide, allowing the piece of dirt to be washed through. If the drip does not stop, the carburetor must be taken apart and the dirt removed by hand.

7. Heavy float. Sqmptom: constant drip. The float soaks up gasoline, making it heavier. As it cannot rise as high as it should it is unable to close the valve and so the gasoline overflows. Sometimes this trouble may be corrected temporarily by re-adjusting the levers, but the

effect is not lasting. The float should be replaced or repaired.

A metal float may be inspected by shaking. If there is gasoline inside it can easily be heard. Another way is to place it in boiling water and look for bubbles. Mark the places where they occur. Some use the flame of a match or a soldering torch to expand the gas and find the leaks by the small points of flame which spurt out. There is no danger of the float exploding unless it is heated enough to melt the solder. Pass it rapidly through the flame several times and no harm will be done. Now spin the point of a pen-knife on the hole and it will be enlarged very quickly. The gasoline must be shaken out unless another hole is made to let in the air, but it is best not to make any more holes than necessary. Do not use a nail for the purpose as it puts a dent in the metal which is difficult to straighten. Having removed all the gasoline, solder up the hole carefully but do not put on as much weight of solder as you have removed of gasoline. A small drop is sufficient and even this should be shaved down partly with a knife. Now replace and re-adjust so that the gasoline overflows the spray nozzle. Then change the adjustment step by step until the gasoline no longer overflows.

A cork float may be repaired by first removing all the shellac, cutting it with alcohol. Place a weight on it so as to hold it under the liquid. After several hours the shellac may be wiped off and the float should then be set in a warm place for several hours or over night. This process may be hastened by placing it in an oven, but care must be taken not to scorch it. The float is then liberally coated with shellac and allowed to dry, after which it may be returned to the float chamber and adjusted as described above.

Note that the same symptom, constant drip, occurs with all three troubles just described: worn valve, dirt in valve, or a heavy float. To distinguish them we first prime the carburetor by means of the priming pin, hoping that the trouble is due to a piece of dirt and that it will wash out and so be ended. We then wait for the drip to stop. But if it continues we take the carburetor apart to inspect the valve and float, as already explained.

Water in Gasoline

8. Water in the gasoline. Many carburetors are provided with a water pocket to allow it to accumulate without getting into the spray nozzle. Others have a trap at some point in the fuel line. But when these overflow the water reaches the spray nozzle and the engine stops. Its presence in the gasoline may be due to various causes. It may get into the tank from washing the car or from rain, but it usually comes from the underground tank. This is sunk some eight feet underground, where it is always cold. As the gasoline is pumped out the air passes in to take its place. The air is chilled and the moisture it carries is precipitated like dew on the cold walls of the tank. This collects and runs to the bottom where the pump sucks it out as it accumulates, only a teaspoonful or two at a time. It is poured into your tank with the gasoline and, being heavy, it immediately finds the outlet and runs down into the carburetor, if you have a gravity system. With the pressure or vacuum systems it does not enter the carburetor until a few minutes later. When enough has accumulated it stops the engine.

If this happens just after your tank has been filled you should suspect this trouble and open the drain valve at the bottom of the carburetor or water pocket, catching some on the hand. Water will not wet the hand readily if it is at all greasy or dirty, but will form globules or drops. Gasoline, however, has an affinity for grease and so spreads out thin and sinks right into the pores of the skin. If there are only a few drops in the gasoline the effect is even more striking. The drops of water are repelled like rain on wet paint.

9. Clogged spray nozzle: This is due to dirt lodging in some part of the nozzle and so obstructing the flow of gasoline. It may only weaken the mixture, causing loss of power, or it may stop the engine entirely. This trouble may be suspected if the carburetor floods freely on priming, but a glance at the needle valve shows that it has not been moved. The usual remedy is to unscrew the needle valve so as to allow the full opening of the nozzle and then to prime the carburetor with the intention of washing out the dirt. The valve is then returned to the proper position and the engine started to try the mixture. If it is still too lean the needle valve must be removed and a wire run through the spray nozzle.

10. Spray nozzle out of adjustment, giving too rich or too lean a mixture. This may be tested in various ways, by the dash control, the auxiliary air valve, or by watching the flame at the compression relief valves.

By the dash control: Many cars are now equipped with an enriching device on the dash to give a rich mixture for starting. Pulled out it gives a rich mixture and pushed back it gives the normal adjustment. If a lean mixture is suspected the knob is pulled out slightly. If the engine shows more power when under load or speeds up when idling, it shows a lean mixture. But if it falls off in power the mixture may be too rich.

By the auxiliary air valve: Pressure on this valve gives more air. If the engine speeds up when it is pressed the mixture is too rich.

By the compression cocks: The correct mixture is shown by a reddish-blue flame; too rich a mixture by a deep red or yellow flame; too lean a mixture by a very light blue, almost colorless flame. The flame tests cannot be made in bright sunlght. They will appear best indoors, and preferably at night.

If the needle valve is found to be out of adjustment it should be adjusted as described in the last issue.

Having finished the gasoline line from the tank to the tip of the spray nozzle, we now start the air line.

11. The hot air stove and pipe may give too little or too much heat, depending on the season of the year. In summer the air is warmer and it may be easily expanded too much if all of it passes through the stove around the exhaust manifold. The adjustment where the tube joins the carburetor should be opened to allow cold air to mix with it. The best point will be found by trial. If too much cold air is admitted, there is not enough heat to

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evaporate the gasoline before it is compressed and fired, so a weak explosion results. If the air is warmed too much, we do not take in enough of the mixture and again the explosion is weakened.

In winter we must close the openings and go over the connections to see that the joints are tight. In very severe weather asbestos cord or even a piece of cloth should be wrapped around the tube and any exposed portions of the inlet manifold so as to conserve the heat.

12. Choke valve in main air inlet. This sometimes breaks loose from its fastenings and closes up, stopping the engine. Sometimes the spring breaks, with the same effect. These troubles are easily found and remedied. But if the valve is set to close too far when used the engine may start, but will stop immediately. In this case it should be moved enough on the stem to allow a slight opening around it. This allows enough air to pass to keep the engine running. If at any time the engine starts but stops immediately before you can open the valve, see if the trouble is not at this point.

Auxiliary Air Valve Troubles

13. The auxiliary air valve may have the following troubles: it may be adjusted too tight or too loose, be stuck open or closed, have a broken spring, or the dash pot may be defective.

A weak adjustment gives too lean a mixture when the engine is speeded up, shown by popping back in the carburetor, a light blue flame at the compression cocks, and weak power.

Too strong an adjustment gives black smoke and a pungent odor at the exhaust, red or yellow flame, and weak power.

If the stem of the valve is stuck so that it does not move freely in the guide, the valve may jam closed or partly open. If it is closed, the engine will not respond readily to the throttle, but will show a rich mixture when speeded up. The valve cannot open to allow enough air to enter so as to bring the mixture down to the right strength. If the valve stays partly open, the engine may have strength enough at certain speeds but will be weak when throttled down or may even stall, popping back at the carburetor several times before it does so. This is because it takes in too much air at low speed.

The valve may be stuck because of a bent stem or from grit getting in between the stem and the guide. The remedy is obvious. Sometimes a drop of oil will cure the trouble.

The dash pot may be dry, if of the gasoline type, or may need a few drops of oil if of the air type. A careful inspection should show the trouble immediately. If it is of the liquid type the tube connecting it to the float chamber may be clogged. Run a wire through it.

14. The throttle valve may come loose from its connections to the throttle lever and accelerator pedal. This will be noticed immediately when it is attempted to speed up the engine by these levers. It does not respond. As the connections are all in sight the break should be easily found. Sometimes the accelerator pedal does not return to position when the foot is removed. Look for a broken spring or put oil on all the bell cranks and other places where friction may occur.

Occasionally the throttle valve comes loose inside the carburetor. This will be shown by lack of control. The valve may remain open, racing the engine, or may close too far, stalling it. The carburetor must be removed in order to reach this valve and tighten the screw which holds it to the spindle.

In rare cases the idling adjustment screw is set incorrectly. This may cause the engine to stall, if it is set so that the throttle valve can close all the way, or may make the engine race if it does not close far enough. This should be adjusted so that the engine runs at the proper idling speed when the throttle lever on the steering wheel is placed in the closed position.

15. Leakly inlet manifold. Any of the joints may leak through a defective gasket or by one or more bolts coming loose. This allows fresh air to be sucked into the manifold, giving a lean mixture in one or more cylinders. This is tested by squirting oil around the joints with the engine running. It is sucked in at the leak. Sometimes the air rushing in at a small opening makes a whistling sound. This is an easy one to locate. As soon as the oil strikes it the noise changes or stops. The remedy is to tighten the bolts or to replace the defective gasket.

16. Cold engine. We may provide a proper explosive mixture and feed it to the cylinders but if the engine is cold the mixture is condensed, losing some of its gasoline and making it too weak to fire. The condensed gasoline runs down the sides of the pistons, cutting the oil and increasing the friction, and falls into the crank case to mix with the oil and spoil it. For this reason the car should be kept in a warm place over night so as to make it as easy as possible to start the engine. In case starting is troublesome it is better to place clothes wrung out in hot water around the manifold and hot air pipe than to prime the cylinders with gasoline through the compression cocks because it is the heat which is needed. Ether is good to use for priming because it evaporates readily at all temperatures and gives a very snappy explosion. Use the "washed ether" as the anesthetic grade is too expensive. But the best method is to drain out the cooling system and fill it with boiling water. If an anti-freezing solution is used it must be saved and put back later. Owners who store their cars in a cold garage all winter should consider installing one of the electrical devices which heat the inlet manifold. This gives the necessary heat by merely turning a switch and makes but a slight demand on the battery.

Carburetor Troubles Classified

(a) No drip on priming—no gasoline in tank, valve closed at tank, faulty fuel supply system, clogged fuel pipe or strainer, clogged spray nozzle.

(b) Constant drip (flooded) Float valve worn—dirt in float valve, heavy float, float caught.

(c) Rich mixture—at low engine speed—needle valve opened too far. Choke valve closed, flooded float chamber—when engine is speeded up, air valve spring set too tight, or stem caught in the guide.

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(d) Lean mixture—needle valve too far closed; dirt in spray nozzle; air valve adjustment weak, broken spring, or stems stuck in guide with valve open; leaky inlet manifold.

(e) Overflow at top of float chamber, float valve not seating.

(f) Water in carburetor.

Trouble Hunting: Prime carburetor, if no drip trouble is in or back of spray nozzle toward tank. If good drip trouble is beyond that point. Refer to directions above. If engine can be started, note flame at compression cocks. Note if exhaust gas smells strong or is smoky (black). Note if popping occurs at carburetor showing lean mixture.

To Distinguish Carburetor Trouble from ignition trouble. Prime cylinders through compression cocks and see if engine will run. If engine will not run the ignition is at fault. If the engine runs and stops the carburetion is at fault. Sometimes we can tell by the way the engine stopped. If engine stopped suddenly, as if the switch were opened, ignition trouble is indicated. If the engine grew weaker, missed a few explosions and stopped, carburetor trouble is indicated. Sometimes a back-fire occurs just before stopping, showing weak mixture.

Care In Filling Tanks: (a) Stop motor (b) prevent spilling (c) Extinguish all open flame lights near car. (d) Strain through chamois skin or fine wire gauze. This removes all water and dirt.

Store Gasoline: In a cool, well-ventilated place. The under-ground tank is best.

A TIP TO AUTO ACCESSORIES DEALERS

Do you know that the tar removers you sell to motorists with which to clean up their machines after a battle with newly tarred roads is also one of the best things obtainable for taking ordinary house paint off glass? Those who have cleaned the windows of a new house or a newly painted house will appreciate this.

If accessories dealers will advertise their line of tar removers for this purpose, they will soon find themselves serving customers who do not own an automobile and never expect to own one.

USE THE HYDROMETER FREQUENTLY

By James F. Hobart.

DOWN here in the "Peninsular" State (Florida), radiators never freeze up—that is *hardly ever,* but an erratic temperature of 26 degrees once in a great while may cause trouble. Usually, however, radiator troubles are far from being those due to freezing. If anything, it is in the other direction of too much heat. While Florida official temperatures rarely run above 90 degrees—in the shade—nobody rises to state how high temperatures are in the sun, and particularly in the engine-hood of a car upon a brick or rock road. Then the range between temperature of the surrounding air and the boiling point of water is reduced to a point which makes it problematical indeed as to whether the radiator can keep the circulating water below the boiling point or not.

There is another thing which the long warm days "get after" and that is, the solution in the storage battery. A man using a car a good deal in the summer months should keep the jug of distilled water handy every instant and should use the jug frequently—at least, he should watch closely for the need of the water jug and protect the battery plates by adding more water "just before it's needed." The hydrometer should be used constantly. If you have none, then obtain one "pronto" and test out the electrolyte often enough to be sure that the solution tests at all times between 1.275 and 1.300.

A little dinky hydrometer costs only a dollar or two, but it certainly can put one wise regarding storage batteries. If the instrument shows that the liquid in the storage battery—with proper amount of water added—tests to 1.300—pure water tests 1.000—then the battery is fully charged and should do full duty with no trouble.

But when the hydrometer shows only about 1.200 it means that either the battery is not being properly charged or that it has been overworked by having too heavy a current taken from it. From the above, it is evident that the distilled water bottle and the hydrometer are vitally necessary to the Southern automobilist. In fact, they are equally useful to any car driver or owner in the United States, in the North, as well as in "Dixie."

GUARD AGAINST DETERIORATION

HAVE you ever noticed how quickly rust eats a hole through the mud guards, hood or body of your car after the enamel has been worn or knocked off, exposing the metal to the action of the elements?

It pays to keep a little can of auto enamel of the color of your body finish in the garage ready to touch up any bare spot as soon as it appears. It may not look just as well as a complete new coat, but it will prevent rust and at the same time look a lot better than the bare spot with its coat of rust.

A PROBLEM

The situation of the young Irishman about whom Answers tells the following anecdote was indeed unusual. He had just informed a friend that his sister had been blessed by the arrival of a new baby.

"Boy or girl?" asked the friend.

"That's just what is bothering me," was the reply. "Bedad they don't say in the letter, and now I don't know whether I'm an uncle or an aunt."

A good customer is sure to be reasonable if you handle him right. Any customer is likely to be cranky if you handle him wrong. Tact in business is knowing how to handle different customers so that each will be pleased with his services and inclined to "come again."

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Advertising That Pays

Why Some Advertising Brings Good Results Quickly and Other Does Not Pull

By F. L. Almy

THE morning's mail, a few weeks ago, brought to us two very interesting letters. Interesting because of the contrast in ideas and because they illustrate very fully the whole point of this article. The first letter which we opened was from an advertiser who sells a fairly expensive machine tool. The advertiser wanted an explanation. He wanted to know why a particular piece of his copy had given such wonderful results in our magazine, results which amply paid for his whole year's outlay in it.

As a contrast to this was the second letter. This advertiser markets a machine which sells at about the same figure as the first man we mentioned. The second man claimed that his ad. was not "pulling" as well as it should. The market demand for the products of each manufacturer is about the same. The space taken by their respective advertisements was similar and the period of time covered, the same. Just why should one advertiser obtain such excellent results while the other was not satisfied? We think that the answer applies to all kinds of advertising from individual to corporation and the answer is our text for this article. "Your Copy Must Appeal To Those Whom You Would Sell."

It doesn't matter much whether you are selling a finished automobile or a spark plug—there are certain rules to which you must conform before you can interest the buyers. After the prospects are interested you must show them why they should buy your spark plug or automobile in preference to that of a competitor. And after you have sold the product you must keep good faith with the customer and by so doing add a "booster" rather than a "knocker" to your list.

The matter of obeying the rules of interesting the buyers and of keeping your customers as friends, all depends upon one thing—"personality." Each sale represents the solution to an individual problem, and failure to make sales is an indication that the person who tries to sell, thinks that all buyers are alike. Your salesman may walk into one buyer's office, slap the latter on the back, tell him a funny story and come out with a thousand dollar order. He may do this to a second man and come out of the office with nothing more than a black eye and a torn collar. And it is the same with advertising, copy which appeals to one class of buyers will not appeal to another class.

It makes no difference whether you are advertising in daily newspapers; in your show windows; on sign boards or a national magazine, that quality which we have termed as "personality" counts largely in the results.

For the purpose of illustration and analysis, Mr. Reader, we will assume that you are selling spark plugs or some similar accessory in a small town. You have decided upon a certain amount of advertising and have decided to put this advertising into your local papers on the moving pictures screen service in your local theatre and in your show window.

Lock yourself in your inner office and study all the factors entering into the problem; your product, your patrons and the mediums in which

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you will advertise. Do some serious thinking.

Your product is the first thing to consider. Just how does it differ from other products of the same kind? Why should anyone buy it? Will it save time? Money? Will it make the operation of the automobile more satisfactory? Be specific and truthful to yourself and write down every good point in favor of that which you are selling.

After doing this, try to put yourself in the place of the buyer, the automobile owner, and ask yourself why you should waste your good money for the thing. Try to sell your own product to yourself. At a later date you might consult an owner, show him your product and get his opinion.

As a customer, ask yourself all about the product and put these questions down on paper. Then compare your arguments for your product contained in your first list with the questions in the second. Do not start your advertising campaign until all questions are fully answered.

With this data you should have a comprehensive set of selling arguments. Some of the arguments are good for certain people, others for another class. Analyze the buying field. Spend a few evenings in the moving picture house, in which you will advertise. Are the people "high-brows" or are they of the working classes? Are they city men or from the country? Study people.

"I installed a New Set of Piston Rings and beat Joe home by nearly an hour—he was wild!"

If you find that the patrons of the theatre on Mondays are "high-brows," then on that night your copy should appeal to their sense of beauty by displaying an art design showing your product as a name only. Or you may give arguments to show that your spark plug, for instance, will not give them road trouble and cause delay, that it will last for years. With these men time is money. They are not interested in the first cost of your product, they will pay anything within reason if they know that they are buying a dependable device.

You find that on Wednesdays the farmers from the outlying districts patronize the theatre. Your copy for them should show why your product will give them satisfaction in operation. They may own tractors or trucks and every delay means loss of money. Call this fact to their attention and try to show them that with your product installed, all delays are obviated. They want facts and facts only, not a beautiful design or a lot of frills.

On Saturday afternoons you find that the kids attend the performance. Give them a comic cartoon or a funny rhyme or something they will remember and repeat to their parents. Fix it so that they will remember what you are trying to sell. In the evening you can bring forward all of the money saving arguments in favor of your product because Saturday evening is the time when Mr. Common Man attends the "movies."

In the same way you must analyze the field covered by your local newspaper. If the paper carries a special section for a certain class, farmers for instance, on a certain day, then let your copy conform with the requirements for farmer trade. Change the copy from day to day and from week to week until it has carried your personality over. Use comic copy; "high-brow" stuff, slang, and logic on various days until you feel that you have appealed to every possible customer.

The same ideas hold true regarding show window trimming. A big bunch of comic window cards may draw a crowd to your side of the street only on certain days; on other days you may find that an ornate display attracts the most attention. Find the reason for this and trim the window accordingly.

A Silent Salesman

If you are selling a finished automobile the same process of analyzing your field applies. The man who can sell the most goods is the one who can put himself in the buyer's shoes and get the viewpoint of the man to whom he is selling.

If you will consider the matter of advertising from the proper view point you will realize that your advertisement, whether it is a show window or a small space in a newspaper, is a silent salesman. The only difference is that the salesman can suggest questions and then give his answers while your little ad. can only say something and then its duty is ended.

Suppose you gave one of your salesmen a number of names and asked him to call upon the men. Suppose you told him exactly what you wanted him to say about

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your product, you gave him certain set phrases, certain statements and you insisted that he go to the men on the list, say his little piece and then leave. Would you expect him to give satisfaction? Do you think that he could "parrot off" his little story to all of the men and get away with it? I doubt if he would earn his lunch money under these conditions and yet is this not what your advertisement must do?

Your advertisement works under a serious handicap because it can say only what you tell it to say. The more care you use in compiling your advertisement the more reasonably can it present your case. If you work properly your advertisement has an advantage over a salesman.

Your salesman can make a call, present his case, meet the objections and either he sells the goods or he doesn't. If he does not get an order he cannot tactfully return the next day and the next and so on for he would wear the "Welcome" sign off the mat and sooner or later wake up in the hospital if he pestered the buyer long enough. But your advertisement can hammer away on the buyer from day to day without causing offense. Sooner or later it will present an argument which will appeal to the buyer, if you change the copy often enough, and then your little ad. salesman has made good.

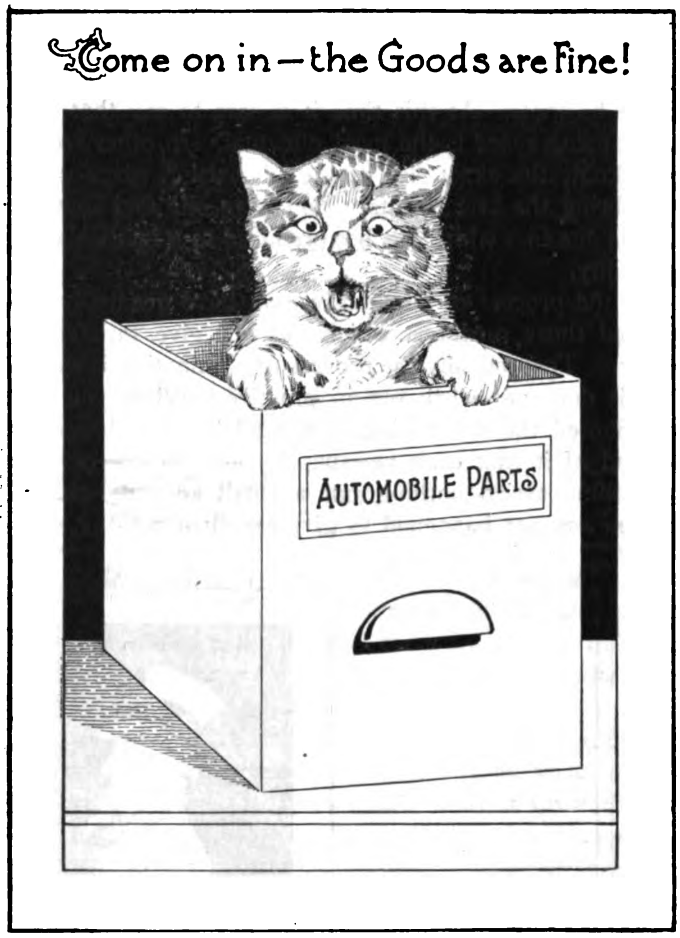
Up to this point I have taken for granted that you know just what advertising mediums you wish to use. Again I will compare your advertising with a salesman because it is the plainest way to bring out the point which I will make.

When you start to market a product you figure on the methods you will use, the size of your shop or salesroom and its location. These facts are determined from your experience and the money back of you. In the same way you estimate the probable amount of business and if you sell accessories, you decide upon how many clerks to hire. You make mistakes, perhaps, at first in hiring too many salesmen (as I shall term the clerks) or too few. One salesman does twice as much work as another and you fire the poor one as soon as you can get a better one. You strive toward an ideal where each clerk sells the maximum possible.

You started, perhaps, with a few mediocre men, paying them each a certain salary. As time passed you realized that it was policy to pay one more than another because that one produced more business for you. As you gradually secured the services of good men, your payroll increased accordingly and you found that it pays to get the best men. Twice as much business from one clerk than another is worth twice as much pay, and sometimes more. The clerk who does not average to earn his salary is not worth keeping and, in fact, should be kicked out because he is in the way of the others who might do the work much easier. I am stating nothing but facts which we all know, simply to bring out my point.

When Advertising Does Not Pull

Your advertisement is a silent salesman and should be put on the same basis as one of your clerks. If it doesn't bring in business then you can't afford to keep



it. If it brings in business you can afford to pay it more that is, increase the space it takes up. Just as with a clerk, there is a limit to the business it can produce. If you invest more money in that ad. and it doesn't bring in a proportionate increase of business, cut its salary, that is, reduce its space.

(Back again to the clerk proposition) Suppose you tell your clerk that he can only give a prospective customer five minutes of his time. Can't you see that you are reducing sales to a mathematical problem, you are leaving the personal element out of the question? It may take that clerk ten minutes to sell your product to your class of trade. By limiting his time you cut his sales to zero and yet is the clerk to blame? No, for only by experiment can you determine how much time should be given to your class of trade. So it is with advertising. Only by experiment can you determine the size of the space which you use for the size of your space corresponds to the time given by your clerk.

If you advertise in a small way and the returns are not satisfactory, perhaps it is because your ad. is too small to tell the story, try a larger one even if you have to reduce the number of mediums in which you advertise.

If you are sadly limited in your advertising appropriation there is but one sure line of reasoning. Divide your appropriation among the mediums you have chosen. Watch the returns and pick the best mediums, then concentrate upon these mediums and put all of the money in them still watching the returns. If the returns grow

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proportionately, eliminate the less satisfactory ones and bunch the appropriation in those left. There will come a time when you find that larger space does not bring more business. At this time it is safe to say that your advertising space is the most effectual. In other words, you know the exact size of the advertising space which will bring the best results. You have one fact to work upon; one fact which has been reduced to a mathematical certainty.

In the process of elimination you have gradually discarded those mediums which did not give satisfactory returns. Theoretically the process of elimination is sound, but it does not work out in practice. When you first distributed the advertising, you made such a broadcast spread of it that each newspaper, each theatre or each program carried nothing but a small ad. By chance, one newspaper happened to give excellent returns, comparatively, while the other did not bring a single reply. You automatically eliminated the second newspaper as suggested in the preceding paragraph after several trials. But is it certain that this same newspaper will fall down under the new conditions, with larger advertising space?

We would advocate a trial insertion of your new, ideal sized ad., in all of the mediums on your original list before you settle down with the decision that any particular medium is unsatisfactory. We feel that you can get the best only by this experiment.

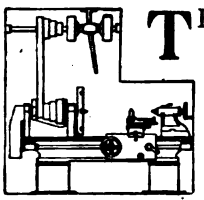
And this brings us back to our opening paragraph and the problem presented by the two advertisers we mentioned therein. The first man, the satisfied one, was taking the correct space for his advertisement. He was able to teii the story about his product and had studied the field which he wanted to reach. His copy appealed to our class of readers and naturally he obtained results.

The second man, the dis-satisfied one was wasting his money on an ad. which didn't tell the reader anything. Although he took the same space as the first man, his product naturally met with more resistance and required more selling arguments than the first man's. Of course his ad. was un-successful. Had he but studied the field and aimed to meet the objections before they were formulated, then only could he have made his investment in advertising pay.

Summing up we would say that the vital points to consider in any kind of advertising are: Know your own product; know the market; know the mediums in which you advertise; take space enough to give the arguments in favor of your goods and finally make your copy up from the buyer's standpoint, instead of the seller's.

Spring Cleaning

Second Chapter Covering the Overhauling of Pistons and Connecting Rods



THE idea of "leaving well enough alone" can be properly applied to main bearings, connecting rods and cam-shaft bearings. Unless there is reason for making repairs to these units, one should not touch them. As a general rule main bearings do not require renewal unless the oiling system has failed. Main bearings are made long and large in dimensions and are shimmed up so that they can be adjusted as they wear from normal usage.

If, in overhauling the car for the coming season, it is found that the main bearings should be replaced with new, then the engine should be removed from the car because it is practically impossible to fit the bearings properly when the engine is in the car.

Cam-shaft bearings may be fitted without removing the engine, while wrist pins and connecting rod bearings can be replaced with but little work.

In our last issue we took up the subject of grinding valves and replacing guides, as well as valve clearance adjustment. It is to be assumed that while doing this work, the owner has made an examination of the wrist pins, connecting rods, etc., with the idea of finding how much work is to be done. Knowing that either the connecting rods or wrist pins need attention, the cylinder head will not have been replaced. If the owner knows that the cam-shaft bearings need replacing he will not have adjusted the valve clearance until after the bearings have been fixed.

Before making any repairs to the parts mentioned in the last paragraph it will be necessary to remove the oil pan from the engine. For convenience we will consider the repairs in the proper order beginning with the pistons and working downward.

Compression Leakage

A careful examination of the cylinder walls will show, in general, the condition of the piston rings. That is to say, if the cylinder walls show black, carbonized streaks, then the gas and compression leaks past the rings and new rings will be necessary.

The general performance of the engine would have indicated any compression leakage, had there been any. The engine would not have given full power, nor would it have operated smoothly at low speeds. If any of the cylinders indicate gas leakage, then the pistons in them will have to come out and new rings be fitted. Otherwise this may not be necessary.

The next step is to find if the wrist pins are loose. Crank the engine until one of the pistons starts on its up stroke. When the piston has traveled upward for about half its stroke, press down with the hand upon the top of the piston. With a little practice and patience you will be able to decide whether there is any play in the wrist pin or not.

Mark all of the parts which you remove, so that you can replace them in exactly the same positions as they are before you remove them. I suppose that you will think this a rather unnecessary precaution but it isn't.

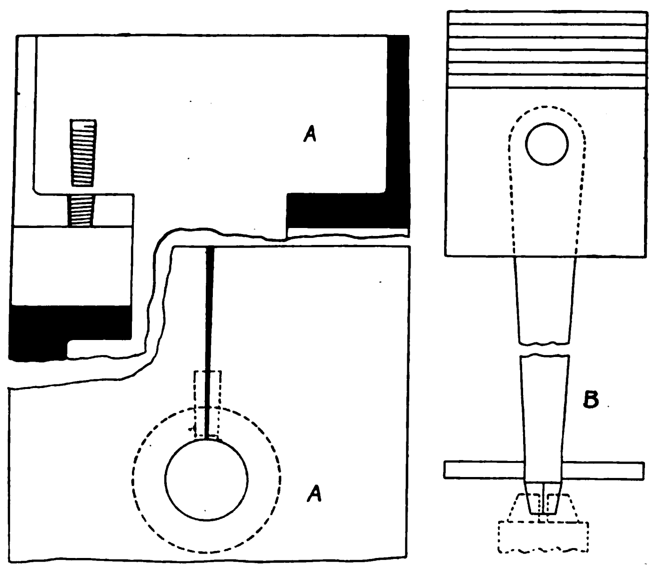


Fig. 1. Construction of the Cylinder Lapping Tool

Rings wear to fit cylinders, pistons assume the best shape and bearings are worn into place, far better than they can be fitted by hand.

Mark the connecting rods so that they can be replaced on the crank-pins in the same relative positions as when removed. Do the same with the connecting rod caps. Before removing the parts, examine each bearing with

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the idea of deciding whether new bearings are necessary, or not.

There is a right and a wrong way to remove pistons and connecting rods. First loosen the connecting rod cap retaining bolts and with a knife separate the various shims but be careful not to bend the corners else the shims will not fit properly when the member is replaced.

Take out the retaining bolts being careful not to drop the shims on to the floor. The shims must be kept in their proper places, and in *the same relative positions* between the rods and caps. Just as soon as the retaining bolts are out and the connecting rods can be disconnected from the crank pins, the caps, together with shims, should be put back again.

In the majority of engines the pistons can be pushed upward and removed from the top. In these engines there is but little room in the crank case and should the piston drop downward and one of the rings expand below the cylinder one can spend the better part of a day trying to get it back again. Always try to push the piston upward just as soon as it is disconnected from the crank shaft and the cap is replaced.

In some engines the big end of the connecting rod is larger than the bore of the cylinder and it is impossible to remove the piston from the top. If the engine is not fitted with crank shaft counterbalances the piston can usually be removed from below.

If this type of engine is fitted with counterbalances, then you *may* be able to get the pistons out from the bottom, otherwise you can choose either of two methods, remove the counterbalances or remove the pistons from the connecting rods and take the pistons out from the top while the connecting rods can be taken from the bottom.

We would not advise you to remove the counterbalances because it is so easy to get the crank shaft out of balance. Should the balances be replaced, even a fraction of an inch, out of the proper position, then the crank shaft will be out of balance and the engine will vibrate.

The second method mentioned, that of removing the pistons from the rods is advisable. In practically every case the connecting rods are longer than the cylinders. That is to say, when the piston is pulled up as far as possible and the big end of the rod comes against the lower edge of the cylinder, the wrist pin is slightly above the top of the cylinder. With a little patience the cotter pin and locking screw can be removed and the wrist pin released. The piston can then be pushed upward as far as it will go, the wrist pin taken out and the rest is easy until it becomes necessary to replace it.

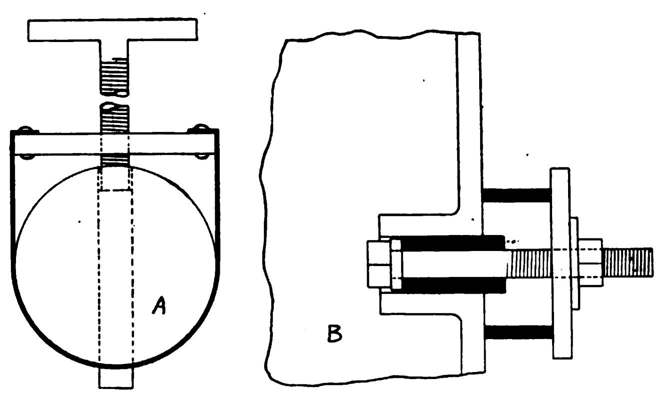

Fig. 2. At A, Tool for Removing Wrist Pins; at B, Tool for Removing Wrist Pin Bushings.

To replace the lock nut, or set screw, inside the piston you can use a small bar magnet mounted on a long stick, or possibly a long socket wrench in some cases. The cotter pin may be replaced by sticking it on the end of a pointed wire.

Before making any repairs to the piston, connecting rod or any of the attached parts, weigh the assembly carefully and make note of this weight. It is advisable to repair each piston assembly by itself and to replace it before another is taken from the engine. If this procedure is adopted there is no chance for transposition of parts.

The cylinder should be carefully calipered at a number of points with the idea of finding whether or not it is perfectly round. The measurements should be taken at points near the top, at the middle and at the bottom. If the cylinder is not round, or if it is of a larger diameter at the bottom than at the top, a notation should be made on a memorandum because you will need these facts.

As a general rule cylinders will retain their shape within a few thousandths and unless they are scored it is possible to fit pistons and rings to such oval cylinders and still get satisfactory operation from the engine. By this we do not mean to recommend the continued use of oval cylinders. Undoubtedly the engine will give its best work only when the cylinders are in perfect condition. But for the average owner who does not care to go to the expense of having the cylinders rebored or reground, we make this suggestion.

An approximation of roundness, if there is such a thing, may be obtained by lapping, a job which requires patience, but which is well worthwhile.

Cylinder Lapping

Before restoring the cylinders to their original shape the owner must make a decision. If the cylinders are lapped, then it will usually be necessary to install new pistons and new rings, with the attendent work of fitting the rings. If the owner wishes to go to this expense, then he can lap the cylinders himself or have them rebored or reground. Either of the latter methods of repair are far preferable over the makeshift method of lapping.

Lapping cylinders is really a method of grinding by hand. For the purpose an old piston should be used. Since, after lapping, it will be necessary to replace the pistons with new, one of the pistons which has been removed can be used.

In figure 1 is illustrated a handy lapping tool, made from an old piston. The piston head is removed. This can be done on a lathe, or with a hack saw. The sharp edges should be filed off. At one side, where the set screw is usually located, bore a hole and tap with a 1/8 inch pipe tap. As most of the readers know, the pipe threads are tapered, a feature necessary in this tool. Then, with a hack saw, cut a slot from the top of the piston through to the wrist pin hole as shown in the illustration. The wrist pin may then be inserted through a wood

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handle and the piston as shown at B in the illustration. The tool is now ready for lapping the cylinder.

Coat the outside of this lapping tool with a medium grade valve grinding paste and slip it into the cylinder. Screw a short length of ⅛-in pipe into the hole, previously tapped with the pipe tap, until the tool expands against the cylinder wtih just enough pressure to grind but not enough to bind. Move the tool back and forth in the cylinder being careful to lap the whole length at each stroke. As the tool is moved back and forth, gradually turn it so as to lap the whole circumference. Do not change the pressure until a complete revolution has been made.

As soon as the surface of the cylinder indicates that the whole surface has been covered, fit the handle to a bit-stock and with the same backward and forward motion, turn it with a rotary motion. As the cylinder is gradually ground to shape it will be necessary to tighten the pipe nipple and exert more pressure upon the cylinder.

We might say that the rotary motion with the bit-stock is the more important one because it is this which brings the cylinder to round. The backward and forward motion at first was simply to remove the glaze and any ridges which might have been present.

New pistons should be fitted to all cylinders which have been lapped, re-ground or re-bored. The pistons should be .001 of an inch smaller, at the top for each inch of piston diameter, than the cylinder. That is to say if a piston were four inches in diameter, it should be .004 of an inch smaller than the cylinder.

This clearance is close enough for ordinary purposes but in the better class of cars more care is taken, pistons are often tapered. In these cases, as a rule the clearance is .001 at the top, for each inch of diameter and .0007 for each inch at the bottom. A four-inch piston would have a clearance of .004 at the top and .003 at the bottom.

The statements made apply only to cast iron pistons. Where aluminum or alloy pistons are used, the proper clearance figures should be obtained from the manufacturers.

If the cylinder has not been rebored, reground or lapped, or after lapping it is smaller at one end than at the other, then the piston should be fitted to the top of the cylinder and the proper clearance, as determined by the dimensions of the top of the cylinder, made.

All Parts Must Balance

So long as the new pistons together with the connecting rods, wrist pins, etc., weigh the same as the old assemblies, then it does not matter about sizes. Thus it is possible to install a new, oversize piston in but one cylinder, leaving the old equipment in the others. If the new piston weighs more than the old, then it is an easy matter to remove metal by boring holes in the skirt, at any point below the wrist pin boss. In any event, the new piston must weigh the same as the old, or the engine will be thrown out of balance.

Since we discussed at length the method for fitting piston rings, in our December issue we need not take up this subject in this article, except to state that where the cylinders are worn oval, and the owner does not care to go to the expense and trouble of making them round, the rings should be pinned on the pistons, to prevent the former from rotating in the grooves.

Two systems are in use for carrying the wrist pins in automobile engines; in the first, the wrist pins are fastened to the pistons and the pins rock in bushings which are fastened to the connecting rods. In the second system the wrist pins are locked to the connecting rods and the pistons are bushed to receive the ends of the pins.

There are very few engines in which no bronze bushings are provided for the wrist pins, but in these cases the pistons may be reamed and fitted with bushings because the wrist pins always rock in the pistons rather than in the rods.

With the piston firmly held in a vise and the connecting rod grasped in both hands it is an easy matter to locate any play in the wrist pin fitting. If there is the slightest play, then the worn parts should be replaced. Side play, if not excessive makes but little difference in the action, in fact a slight amount of side play is advisable. But there should be no end play in the connecting rod, else it will cause a knock. A piston which binds upon the wrist pin, but which can be moved with a slight amount of effort, is ideal.

Removing Wrist Pins

It is often a difficult matter to remove the wrist pins and bushings from pistons and connecting rods and it is not advisable to hit the parts with a hammer because of the danger of cracking the light walls of the piston. The tool shown at A in figure 2 can be made by any man, handy with tools. It consists of a flat plate and a long, ⅜-inch set—or cap-screw. The cap-screw is placed in the center of the plate and the plate fastened to the side of the piston by two iron wire bands. The device, in this position, presses upon the wrist pin and by turning the screw down, the former is pressed out of the piston or the connecting rod end as the case may be.

The tool shown in figure 2 at B is nothing more or less than a long cap screw, a nut, two washers and a pipe nipple or bushing slightly larger than the bushing in the piston. The action of the device and its construction is clearly shown.

It doesn't make much difference whether the old bushings are battered and nicked and if particularly stubborn they may be sawed out of their places because they will be replaced with new. But the greatest care must be used when installing the new bushings, or they will be upset on the ends and will not fit the wrist pins. The tool shown at B in figure 2 works just as well for forcing the bushings into the piston as for removing them and should be used for this purpose too.

Wrist pins usually outlast the car and seldom require replacement. The bushings are the units to replace. But if a shoulder is worn on the wrist pin, at the bearing surface, then that unit should be replaced with new. After the bushings are in place in the piston, ream them to fit the wrist pins. If a reamer is not to be had, a file will do.

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Electric Wiring in the Shop

Instructions for Installing Electric Wires so as to Comply With the Law

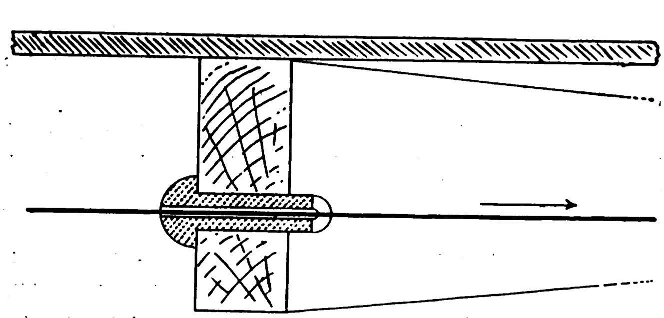
BY J. F. SPRINGER

ELECTRICITY may be wanted in the shop for a variety of reasons. It may be desirable to light it partially or altogether by the use of current. Or, it may seem advantageous to install a motor or two. Whatever the purpose, the job must be properly done, or there will be more or less danger of fire, to say, nothing of bodily hazard. There are all kinds of ways for things to go wrong, if the wiring is carelessly done. Thus, one may think the insulation sufficient protection; and while this is fairly true during the eairly life of good insulated wire, yet later on the insulation may be worn away by abrasion.

One insulated wire may cross another. Actual contact may seem a small thing. But this actual contact may be the very reason for abrasion of the insulation at that crossing point. If one of the wires carries a heavy current, trouble may come. Besides, the insurance companies demand that the wiring be done correctly, and the best of them, say what is right.

Perhaps the very best thing to do is to conform strictly to the requirements of the leading insurance companies or associations of companies.

Wiring may be done so as to be out of sight, or the wires may be put in on the front faces of the ceiling and walls where it is in plain view. While the latter method is somewhat unsightly, it is easy to carry out. It might be thought especially safe, because always in sight. The trouble is, however, something less than the whole of it is apt to be what is plainly visible, leaving parts in out of the way spots. Besides, exposed wiring is very subject to accidental damage. We will assume, then, that the wires are to be run behind the plastering.



Cross-section of joist tube insulator in place. Wire when drawn tight should be pulled in direction of arrow.

There are several problems. First, the vertical wires. These will be behind the wall plastering, but in front of the brick or other wall. These wires are conveniently put down *from above*. Then, the horizontal wires are to be put in between the flooring the room above and the ceiling plaster of the shop itself. These wires may run parallel to the floor boards or perpendicular to them. In the one case, the wires will have to pass through joists; in the other, they will parallel them. In fact, the job of wiring actually in hand may require the wires to run in both directions. Where the wires parallel the joists, it will usually be suitable to attach them to the side of one or more of them. Only, the workman will have to get at the joists through the floor. Once he gets proper access to the joists, the work of attachment will ordinarily not be difficult. Where the wires parallel the flooring instead, the workman's problem consists in getting below thhe floor and then passing the wires suitably through the joists.

Another problem consists in arranging one wire to cross another and yet to introduce no element of danger from actual contact. Even wire that are going in the same direction may need protection against one another, if they are close together.

Another Problem

Yet another problem is involved in making junctions. Thus one wire may join another in such a way as to form a T-joint. Or, the junction may be of different type. The workman must know what should be done and how to do it; otherwise, there is apt to be a faulty joint. Joints are, in fact, rather dangerous affairs, unless one knows what he is about. Neither wire must unduly strain the other. The connection of wire with wire must be effective and stay effective; otherwise, the current will be impeded. Where insulation has been disturbed, as by the necessity of making a joint, one needs to know just how to insulate the place all over again.

These are sufficient samples, perhaps, to indicate that the proper wiring of the inside of a building is not a job for a careless and ignorant person. It requires knowledge and it requires judgment and patience in doing the actual work.

Wiring Through the Joists

Running the wires through the joists means, generally, running them parallel to the flooring. The thing to do is to take up one or more boards and then get the several joists ready. Suppose we take the case of two wires of one and the same circuit. Two holes—not one hole—are to be bored through the joists. They should be, say, five inches apart, center to center. Let them be set not less than two inches below the tops of the joists. The wires will then be distinctly separated from the flooring, and this is a thing wanted.

It is good practice to insert in each hole an insulating tube having a length considerably in excess of the thick-

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ness of the joist. Such tubes may be 9/16 of an inch in outside diameter. The hole is bored a trifle larger, say, with a five-eighths inch bit. These insulating tubes are to be obtained from an electrical supply store. Each will have a flange-like head, which serves to prevent the tube from going all the way through. All the tubes belonging to a stretch of wire are to have their heads in one direction. One object in view is that when the wire is pulled through and drawn up tight, the several tubes will all be left undisturbed or else pulled into better position with the head up against the side of the joist.

This matter is to be borne in mind, too, when putting the wire through. That is, the wire is run through each tube from the head to the point and not, in any case, in the reverse direction. The holes are to be bored horizontal. But, in actual practice, this may turn out to be difficult. If a slight deviation is to be allowed, then the slant down is to be from the head of the insulation tube to the point, and not the reverse. The slants will all be parallel.

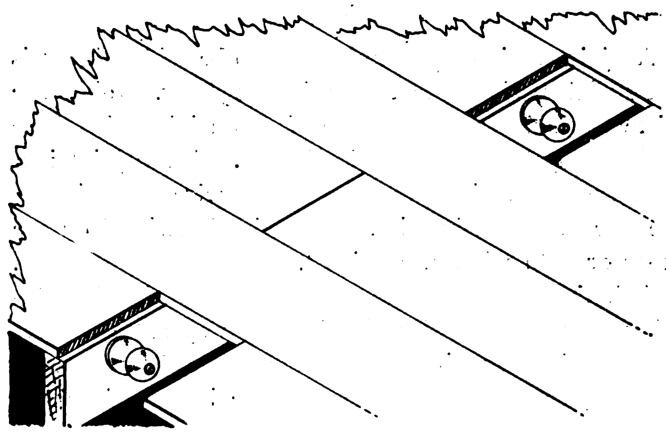
When the wire is pulled up tight, after being threaded through the lot, gravitation, the pull, and the location of the flange head will co-operate. Where joists over-lap longer tubes will be required. Let this be borne in mind when making out the order. These tubes are very properly of unglazed porcelain. For an ordinary house, a proper length will often be 4 or 5 inches. But joists differ in their thickness; so that no fixed length can be stated.

Joist Insulating Fixture

When the wires run parallel to the joists, they will usually be perpendicular to the flooring. Taking up a board or two will then not help much. Access is to be obtained otherwise, but still through the floor. It is quite proper to run one wire along one side of a joist, attaching it to insulators secured to the joist. Access to the joist will, accordingly, be wanted at these locations, and perhaps nowhere else. A proper insulating fixture to attach to the joist is a *knob* made of porcelain. These may be set 4 or 4½ feet apart along the joist. Accordingly, the floor is opened at suitable intervals along the joist location. No mistake must be made as to proper spacing. The knobs must be close enough together so as to eliminate any hazard of the wire touching the ceiling because of the sag. It will be much better to put the knobs closer together than necessary, than too far apart. Usual sizes of knobs for small jobs are Nos. 5 and 5½. These have a nail hole one-quarter of an inch in diameter and thus provide for a suitable means of attaching them to the joists. No. 5 and No. 5½ differ in respect to the distances they hold the wires off from the joist when in position.

The knobs in mind in the foregoing are solid, single-piece articles. There is a variation—the split knob. This is a two-piece affair and so made that when the screw used to fix it to the wook work is properly tightened up, the two pieces grip the wire. It is doubtful whether is is really better. The screw has two duties instead of one and may fail in one or the other. One not expert in wiring may fail to force the screw all the way home, especially in the side of a joist below the floor. However, the split knob is favorably spoken of for positions in which the opportunity for the screw driver is good and where neatness of appearance counts.

It is approved practice to use *rubber covered wire* for indoor service. It is passed through the insulating tubes that run through joists and along the joists from knob to knob.



Short pieces taken out of the floor alongside a joist. Knobs set in place for electric wire.

In laying out the wiring job, one provides for the *outlet locations.* At the moment, let us concern ourselves particularly with those in the ceiling. At such points, an opening will have to be made all the way through. If anything like a chandelier is to be located here, an allowance of 8 or 9 inches of wire below the ceiling is to be made for each of the two wires of the circuit. Intermediate outlets will usually require no allowance, the wires of the circuit being kept taut. That is to say, one strings two wires, from the point in the wall where the horizontal wires connect with the vertical ones and continues them to the principal outlet and allows enough length to put them below the ceiling 8 or 9 inches. The other outlets are connected up without allowance, separate drop wires being used.

In stringing the horizontal wires, one will perhaps have occasion to pass one wire across and over one or two others. Thus, one may be running a third wire along a joist at a point where two other wires enter and pass through the joist. These may be, say, 5 inches apart. One sets two knobs at, say, 8 inches apart in such positions that a wire strung between them will be 2 or 3 inches above the other wires and so that these wires will be not only beneath the third wire but *between* the two knobs. In stringing the wire from knob to knob, one puts on it two four inch insulating tubes of the kind used to carry wires through joists. These should loosely fill the space between knobs.

The wires used here are to be incased, each, in its flexible insulating tube. This is done prior to putting them in position. Encased in such tubing, the wires will be much larger affairs, and, at times, occasion some difficulty in getting them in place. If there is a clear space between wall and plater and between uprights used in the building, the job may be principally one in which one person drops a stout string with a weight attached

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and then secures the upper end to an encased wire. Another person pulls on the string and brings the encased wire down. Sometimes, however, there will be more difficulty than this. Obstructions may be in the way, projecting boards of the flooring, braces between uprights, etc. The washboard may have to be opened and holes bored and loose things removed. A little ingenuity counts here.

Joints

All joints, without exception, are to be soldered. It is not sufficient simply to twist wires together. Joints are of two principal types. The *splice* is a joint where one desires only to make the wire longer. A *tap* joint is a case where one wishes to run a branch wire to a point off the line of the main wire. One wire is twisted on the other or both wires are twisted, each around the other. This is the first operation. The second consists in soldering over the twisted region in such way as to convert the whole into what is substantially a single piece of metal. For a splice, one removes, say, three inches of rubber insulation from each of the two ends. For a tap, one removes, say 1½ inches of rubber insulation from the main wire, and, say, three inches from the end of the branch wire. When twisted, care is to be exercised lest the coiling be so compact as to prevent the entrance of solder.

Sometimes, it will not be desirable that the main wire be subjected to a side pull from the tap wire. This situation may often be avoided by locating a knob near the tap joint and then running both wires onto it. The branch wire may be run round the knob 1½ turns, and in such way as to hold the main wire on.

In order to make sure that the insulated wire is of a kind *officially approved* by the National Board of Fire Underwriters, application may be made to one of the offices for a copy of the *Code*. This will list the approved wires, and will give other valuable information.

The Service Switch

To the *service switch* run the two wires which bring the electricity to the shop. From it run the wires which carry it into the shop, and to which are attached distribution wires. The fuse block may be installed with the switch. A *main service switch* of suitable design for many cases is what may be described as the double-pole single-throw, knife switch. It connects or disconnects, by a single throw, the two wires entering from the outside, with or from the two wires running off from the switch into the house. This is simple and safe. The house is either connected up completely with a source of current or else it is completely disconnected from such source.

A *fuse block* containing two separate fuses, one for each of two wires, is a proper thing to use. The wires coming from the outside are to be connected first with the block. They should not connect with the switch until they have passed the fuses. The arrangement recommended protects the switch in case of an execssive current blowing the fuses.

COMING EVENTS

March 25
York, Pa. Passenger Car Truck & Tractor Show.

March 19-26
Detroit, Mich. Annual Automobile Show, Detroit Automobile Dealers' Ass'n. Morgan-Wright Building.

March 20-26
Torrington, Conn. Automobile Show, State Armory.

March 21-26
Fort Worth, Texas, Annual Automobile Show, Fort Worth Automobile Trade Ass'n. First Baptist Church Auditorium.

March 21-26
Wilkes-Barre, Pa. Truck Show, Automobile Dealers' Ass'n of Wilkes-Barre, Inc.

March 21-26
Cedar Rapids, Iowa, Passenger Car, Truck & Tractor Show, Linn County Motor Trades Bureau, Auditorium.

March 23-26
Ottumwa, Iowa, Annual Automobile Show, Wapello County Motor Trades Bureau, Davis Bldg.

March
Ardmore, Okla. Fourth Annual Automobile Show.

March
Fort Dodge, Iowa. Closed Car Show, Armory, Automobile Dealers Ass'n.

March
Muskegon, Michigan, Passenger Car & Accessory Show, Automobile and Accessory Ass'n.

March
Schenectady, N. Y. Automobile Show.

March 28-April 2
Columbia, S. C. Annual Automobile Show, Columbia Automotive Trade Ass'n, State Fair Building.

March 28-April 2
Greenfield, Mass. Annual Automobile Show, Greenfield Automobile Dealers' Ass'n.

March or April
New Orleans, La. Passenger Car Show, Automobile Dealers' Ass'n.

March or April
San Antonio, Texas. Fifth Annual South-west Texas Show.

April 3-9
Denver, Colorado, Annual Automobile Show, Auditorium.

April 3-9
Gloversville, N. Y. Annual Automobile Show.

April 4-9
Seattle, Wash. Annual Automobile Show, Motor Car Dealers' Ass'n.

April 11-16
Charlotte, N. C. Passenger Car, Truck and Accessory Show, Charlotte Automotive Trade Ass'n.

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Resurrecting an Automobile

PART 4

By James F. Hobart

"I'M MIGHTY glad I wasn't born an upholsterer," grunted Mr. Simon Smith as he crawled from underneath the top-covering of his big Cadillac car which cover he was engaged in fitting upon some new bows in place of those recently broken when his car went through the rear wall of its garage. The bows were accurately set up on a form or templet made of plank, with eyes and pins to receive the bow sockets in exact duplication of those upon the body of his car.

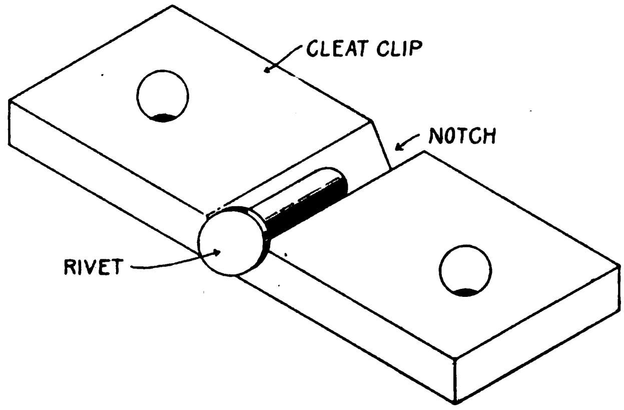
Mr. Smith was making repairs to the top in order to gain experience in that work. To avoid mussing up the car and to take his time with the top repairs without tying up the car, he had erected the bows upon a form built for that purpose with the bow-fastenings accurately located same as on the car. The top was still tacked fast to the rear bow and to one end or side of the second bow from the front. After throwing the top over the bows, a cord had been attached to a curtain strap at the rear and to a bow in front and the free ends of the cords attached to the cross boards of the form in order to hold the bows upright.

The tension straps were then carried forward to the front bow and Mr. Smith stretched the middle strap straight as best he could and fastened it with tacks to the front or horizontal bow which was to be located immediately above the windshield. All the other tension straps were likewise located and tacked fast just as darkness came and the job was abandoned for the night.

Next day, while giving the work a "once-over" to make sure that things were right thus far and safe to go ahead with, Simon noticed that the front or horizontal bow had a "list to starboard" as a sailor would say, and stuck out all of four inches to the left side of the top, while that bow on the right side, was "in" a corresponding distance.

Making a New Start

Mr. Smith mumbled some more words uncomplimentary of the upholstery business and proceeded to dig out the five big eight-ounce tacks which he had the night before driven heads-flush, into the ends of the tension straps. Getting out those tacks was a hard job which had to be accomplished with two cold chisels driven simultaneously from opposite directions as shown by the engraving—in the February installment of this story on page 48. After the tension straps were off the front bow, Mr. Smith attached a cord to the bend of that bow and pulled the cord tight and attached its other end to the socket on the opposite side, thus pulling the "out" side of the horizontal bow into place again. The cord was left there and finally removed only after the top covering had been fastened in place.



Filing Down a Rivet.

Tension Straps Started Straight

Then Mr. Smith crawled under the loose top-covering and beginning at the back, fastened each tension strap to the several bows, being guided by the old tack-holes in the straps and in the roof-pockets which had been replaced upon the new bows. Thus the bows were brought into exact position again and the straps properly tensioned and aligned. But the front bow was new and there were no tack or other marks to go by so Simon placed a stick upon the tension straps at the adjacent bow, marked past the edges of the bow upon the stick, also the location of each strap. Then the stick was transferred to the front bow, centered by the end-marks and the straps properly located from the marks therefor on the stick. This time, the tension straps were properly located and the front bow "had its hat on straight" owing to the brace-cord which was still in place.

After the top tension straps had been located and nailed, the side straps which were made of textile webbing encased in alpaca and cotton batting, were properly placed and tacked fast. When possible to dig into the lining and the cotton, the lower fabric and the straps would be tacked separately. But at two of the bows, the alpaca was not disturbed and a row of closely placed tacks was driven through.

Patching the Top Covering

One large hole had been torn in the top during the accident and several smaller breaks in the water proofing were found. These were "healed" in the following manner: A piece of board was worked in between top and tension straps under the holes, one or two at a time, as the holes were far apart or close together. With a table knife, the imitation leather top was carefully scraped

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all around each hole, then some No. O sandpaper was used and the scraped places well rubbed. Two coats—first, thin and last one thick—of rubber cement were spread evenly around the torn edges and after the cement had dried well, the cloth was pulled off the business side of some inner-tube repair stock, which had previously been cut to the size required, and the pieces were rubbed carefully and thoroughly down upon the cement-covered places.

With a round face "nail-hammer," Mr. Smith lightly hammered each and every inch of each patch in succession and at last accounts, the patches were holding well after having been given a good coat—as was all the top—of an auto top dressing which was well rubbed in with a little brush and a big outlay of muscle. The top then presented a fine appearance.

After the top was finished, the patches in place and before it was removed from the "form" upon which it had been set up, the entire top covering, bows and all, were given a thorough scrubbing with soap and water.

Placing the Top On

There was no one at hand to help Mr. Smith when he removed the top from the temporary form and placed the top upon the car, so after looking all around for and not finding help, he laid the top back as if it were on the car, disengaged it from the form and placed the top upon and overhanging the piazza balustrading. Then he "cooned-it" under the folded top, balanced it on top of his head and thus carried the folded top thirty yards to the garage and slid it, sockets first, over the back of the car and let it settle in place upon the holding irons which supported the top when folded back.

Mr. Simon Smith very vigorously rubbed the top of his head and said something strong about "one-man and one-head" automobile tops, then he proceeded to hook the rear bow sockets upon the studs designed for them. He also removed the small bolts with which the third bow-sockets had been temporarily attached and started to put in the rivets which fastened the sockets together. But the rivets were too large and Mr. Smith had the doubtful pleasure of filing the rivets a sixteenth of an inch smaller and then cutting a quarter-inch off the end of each one.

"Wish to thunder I had a vice" remarked Mr. Smith as he started for the front piazza of his house, with a file in one hand and the rivets in the other. He carefully removed from the plank top-form, one of the board cleat-clips and laid the clip on the edge of the piazza with the rivet in the slot as shown by the sketch. Mr. Smith held the rivet by the head with the fingers of his left hand while a file in his right hand made a flat place an eighth of an inch wide on top of the rivets. Other similar flats were filed all around, then the little ridges between the flats were filed off. A final filing again while the rivet was slowly revolved, smoothed it down in good shape so it fitted snugly into the holes in the bow-sockets—"That's a pretty good lathe but a mighty slow one" said Mr. Smith as he started on the second rivet!

The rivets were cut to length with the cold chisel on the iron wedge. I asked Mr. Smith why he didn't cut the rivets to length and then not have to file down a half inch of length afterwards cut off. "Seems as though the rivet could be held easier in the cleat-clip before it was cut short, and then you know, there was less to cut with the cold chisel after the rivet had been filed down to size!" Mr. Smith is surely a lawyer for argument but I surely will cut rivets to length before I file them to size—every time!

Stretching the Top

Mr. Smith stretched the cord from second bow—mentioned in a preceding paragraph—down to one of the eyes in front of wind shield where the two round straps fastened on. These straps strained the top forward and fastened to eyes in the wind shield frame by means of harness straps. The straps had not yet been fastened to the new bow, as Mr. Smith cannily let that go until he had the top stretched well in place. He roped the top forward as stated, with a light pull on the rope, then he fastened the leather pads, described in a previous chapter, to the broken fabric holding-straps on each side of the back curtain.

The leather pads or clips were not fastened to the broken straps until after the top had been put in place and roped in front. Then the rear curtain was buttoned and the leather clips placed upon the broken straps in such a manner that considerable tension could be given to the clips and hold-down straps and have the turn buttons a bit loose in their curtain button-holes.

That is, the top could be pulled hard and fast without putting too much stress upon the curtain buttons. Evidently, when the straps were held by hay wire, the back curtain had to stand a large amount of the pull and the grummets or button holes in the curtain were badly strained and partly pulled out. In fact, Mr. Smith made up a "waxed-end" of shoe-thread and with a needle on the wax-end and a sewing awl to make holes for the thread, he deftly mended the fabric around the holes, the brass "grummets" being unclinched and removed during the sewing operation.

To save the bother of working with two waxed-ends, Mr. Smith sewed the fabric with a single needle and thread, then went back again through the same holes, thus giving the effect and strength of a regularly stitched, double-thread seam. Afterwards the grummets were put in place again and hammered down over the stitching.

The leather pads were nailed in place against a chopping axe placed behind and the sharp pointed shoe-nails driven right against the axe which clinched the nails so that they could never come out. After a final stretching, the holes were marked and bored in the clips and the screws inserted therein and into the back of the rear seat. It was found that with all the care one hole was a bit too high and the back curtain wrinkled a little from looseness on one side. This was quickly remedied by Mr.

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Smith who cut the lower side of the hole with his pocket knife, making the hole half an inch long. This straightened the curtain-hang entirely.

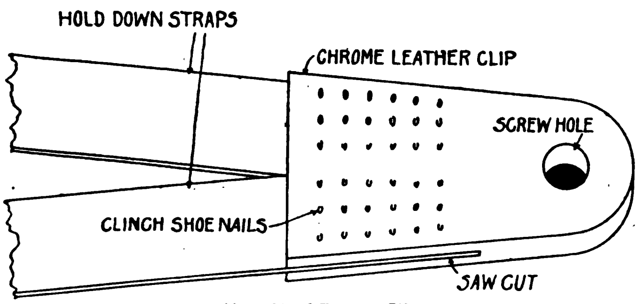
Fastening Front of Auto Top

The rear end of the top was well fitted and fastened and Mr. Smith set about putting on the front hold-down straps. He screwed the attachments therefor to the new front bow in such a manner that the straps leaned slightly in a direction which would help pull straight the front of the top which still showed a slight inclination to lean to the left. This was due to the difference in the bends in the new and the old legs of the front bow and would probably disappear altogether after the top had been in use for some time. But the front hold-down straps were attached to hang plumb when the top was in its proper place. There, the strap-clips were screwed to the bow, the short flat buckle straps hanging therefrom, ready for the round straps snapped into the wind-shield frame.

"More One-Man Top Work" grunted Mr. Smith as he tried in vain to hold the top down while he buckled one of the straps two holes further up than it wanted to go. As it was necessary to pull upward to buckle the strap and pull downward with all his weight to keep the top strained tight, Mr. Smith found himself decidedly in a quandary. If he pulled down, he couldn't buckle and if he pulled up to buckle, he couldn't pull down on the auto top! And there he was, with nobody in sight to help out.

But Mr. Simon Smith was equal to the occasion. He fastened a stout cord to each of the newly attached strap-clips and about two feet above the floor in each cord, he tied a hangman's knot and thrust a stout stick through, each stick being about two feet long. Beneath these cross sticks, Mr. Smith suspended a lot of junk. The tool box was hung below one stick, a dozen bricks below another and a log or two from the firewood pile helped put about 150 pounds on each rope and the top was stretched nicely by the weighted cords.

Mr. Smith then buckled the round strap to the flat top one in such a manner that the snap-hook in the lower end of each round strap came opposite the eye for said hook on windshield frame. To hook in the snaps, Mr. Smith just straddled one of the cords and sat down upon the cross-stick and that side of the top came right down far enough so that the snap could be easily hooked. The same



Top Hold-Down Clip.

operation was repeated on the other side, when the junk and the cords were removed and Mr. Smith had the satisfaction of seeing his auto-top nicely and smoothly stretched and fastened in place.

Painting the Auto Top

To paint the top, Mr. Smith brought out the house step ladder and climbed to its top with a can of dressing and a varnish brush. The step-ladder wiggled, and so did Mr. Smith as he came down in a hurry and said something uncomplimentary to all step ladders. Then he found two pieces of board each about four feet long. He placed one end of each piece on top of a wheel, set the step ladder under the outer end of one board and a barrel under the other end. Then he brought a wide board about fourteen feet long and placed it on top of the two short boards, and—presto—there was a fine stage all along one side of the car and with the step ladder handy upon which to climb upon the stage.

After painting one half of the top, the staging was shifted to the other side of the car and the top-dressing job completed. And Mr. Smith took time to go over all the turned-in surface of the top which chanced to be inside. He also spread some of the dressing over the sockets of the bows, making them look far better where the enamel had been knocked off while driving sockets off old bows and on to new ones.

When finished, no one could tell that Mr. Smith's automobile top was carrying a bunch of *home-grown* repairs. And best of all, aside from his own time which did not count, the repairs to the top cost less than six dollars, divided as follows:—$1.30 for cloth—most of it left—for covering new bows; $1.00 for a new Bow; 50 cents for new rivets, tacks, etc; $1.00 for repairing one broken round hold-down strap.

The Car Tool Kit

Mr. Smith cleaned out the lockers under front and rear car seats and found all the tools thrown helter-skelter into them, together with a number of new parts and a lot of junk which he discarded—threw it into a box which he forthwith named—"the morgue"—And how that "morgue" did grow as Mr. Smith tuned up, during the next few months, that good but sadly neglected Cadillac car! The tools were separated from the other stuff and in one corner of a locker was found a crumpled mass which, when smoothed out after a half hour's pulling and stretching, proved to be a roll for holding tools.

In the rear seat locker was found a fine inner tube hobnobbing with a fine steel towing-cable. Mr. Smith quickly separated the two and put the tube elsewhere. He put it in a front seat locker where the tube could lie without seat-pressure upon the tube, which would tend at all times to twist the air tube sidewise.

There was no jack with the car but one was purchased from a dealer in second hand things at an exceedingly figure. It was a brand new screw jack with a long handle projecting to one side. The handle detached and folded while not in use and enabled the operator to jack up the car without getting almost under it. He made a place for the jack under the locker beneath the driver's seat. In the bottom of that locker, he put the towing cable, neatly coiled to fit, instead of being loosely gathered into a "figure 8" shape.

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Then Mr. Smith found some three-inch by four inch planed stuff and sawed off a piece just as long as would go into the locker on top of the tow-rope. A piece of two inch plank of the same length and seven inches wide followed into the locker and three bits of board about six inches by eight inches were also put in, then the jack and its handle were also packed in. The locker was nearly filled but by careful packing, Mr. Smith managed to put in the speed wrench and the tire tools, thus relieving the other lockers of the heavy tools. The first time Mr. Smith had to change a tire out on the road he blessed the day when he put into the locker the necessary blocking as well as the jack!

Tackling the Tire Pump

There was an engine-driven tire pump built into this Cadillac car and the first time a tube had to be changed, Mr. Smith loosened up the *grease of ages* around that pump and started to pump up a tire. The double plunger little pump was on the same shaft with the Delco Starter-generator and was thrown into gear therewith by simply slipping a spring-held gear into mesh. After oiling and loosening the gears, Mr. Smith threw the pump into gear and cranked the engine by hand. The pump turned over all right, so he started the engine and soon had a pressure of 55 pounds in the tire but could get no more. He drove to a garage and finished inflating the tire to 90 pounds.

With the next tire Mr. Smith tried to pump up with the power pump, the gage showed 55 pounds but the tire got so hard that Mr. Smith stopped the pump and applied a tire gage which registered 90 pounds! Then, Mr. Smith went for the gage in the pump hose. And the next tire he tried to pump up, he could get no air at all through the tube. What he found will be told in the next issue.

HARD LUCK

Their regiment made up entirely of negroes inducted into service down in Dixie, had just received its first batch of mail since leaving the States. And they were reading while waiting for the order to go over the top. "Wash," moaned Jeff, "I'se de hard luckinest niggah what evah lived. I'se done jes got a lettah from my gal an' she's gone an' married 'nother niggah." "Mans man," said Wash, "yo'-all doan know what hard luck am. Jes look't me. Ah jes got a lettah from ma draf' boa'd sayin' Ah'm exempt and won't have t' go t' war." —*Book of Smiles.*

AN ADDITION

In the January issue of this magazine, we published an article regarding garage signs, which has received the praise of some of our readers one of whom has also commented upon the fact that our "Figure 2" is incomplete. In this figure appear the items which are more commonly forgotten by the average car owner. We need only to say that *we forgot* to put the "oil" in the figure, to indicate how important this item is and how easily it is to forget such a common thing. Mr. Green (the subscriber) suggested that the most important item of the oil in the crank case is the one that is most frequently forgotten, and we hereby have proved him correct.

Mr. Green also suggests that the figure itself may be clipped from the magazine and pasted upon the windshield of the car or some other convenient location. We are therefore reprinting it with the correction noted.

HAVE YOU—

Oil in the crank case?
Water in the Radiator?
Enough Gasoline to take you where you are going?
Grease in the Cups?
Sufficient Air Pressure in the Tires?
Some spare Spark Plugs?
A Tow Rope? You never can tell, you know.
Looked over your Car lately?
Sufficient power in the Battery?
A Pump and a Jack with you?

FORGOTTEN ANYTHING?

TIME: BEFORE THE GREAT THIRST

The night was cold and the wine was hot, and the clubman was toddling homeward after doing himself extraordinarily well at the reunion dinner.

"Handsh nearly frozen," he uttered.

Suddenly along the almost deserted street rushed an old-type fire engine, with smoke pouring from its funnel —and the old gentleman at once gave chase to it.

"A' right, keep your bloomin' baked potaties, then! Don't want 'em anyhow!"

A self-made man can beat an old rooster at crowing.

If outsiders loaf around your garage, the insiders will loaf too.

Don't stop with reading your trade paper yourself. Pass it on to the boys in the shop.

Your head may be full of good ideas that will be worthless unless you make use of them.

Prospective buyers will not enter your office and crowd out loafers and visitors. They will stay away.

The car owner has to trust the honesty of your workmen. See that his confidence is not misplaced.

Honest work in the repair shop will help reduce the number of accidents on the road.

Cheerful co-operation is the result of giving strict justice to our employees and associates. Justice calls forth respect. Injustice—resentment. Be as ready to praise as you are to blame.

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Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Informatiation Gathered By an Expert for Your Aid

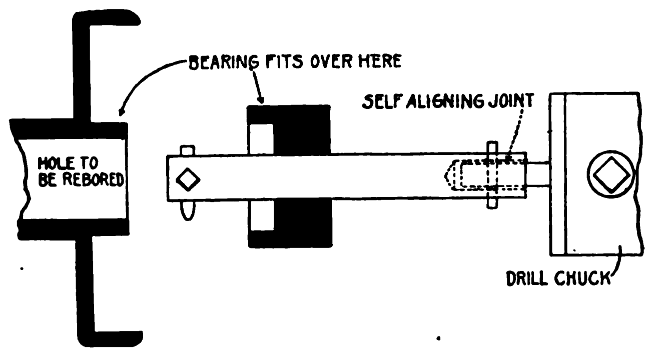
IT was on a Chandler and he had broken off the threaded end of the pump body where it extends out to receive the packing nut, or gland. This happens on lots of cars and invariably you have to dismount several units before a repair can be made: on one end of the shaft is the timing gear drive inside an oil filled case, next comes the pump with the shaft extending right through and with packing at both ends, then at the end comes the magneto or generator—to renew any pump part, you've got to strip the whole works and this takes a lot of time and involves the chance of getting the "mag" out of time.

When the car is new, all is lovely—and the job always looks neat—but sooner or later trouble bobs up around the pump. It all comes from the action of water on the steel shaft. It is a chemical impossibility for the water not to eat the shaft and when it does eat that section where the packing is, the shaft ceases to be smooth, round and straight and it is no longer possible to keep the water from leaking. Then more packing is put in and the nuts are screwed tighter and if something doesn't break, so much friction is put on the shaft that it can hardly turn.

If manufacturers couldn't see their way clear to setting the water pump on a separate shaft or at the end of an existing shaft, I should think they could put in a shaft of the new rustless steel. Barring this, a shaft of tobin bronze might be used, this effectually resisting the action of water. Or again, a sleeve of bronze could be pressed over the steel shaft for a length slightly greater than the pump, just as centrifugal pump makers do for the same reason.

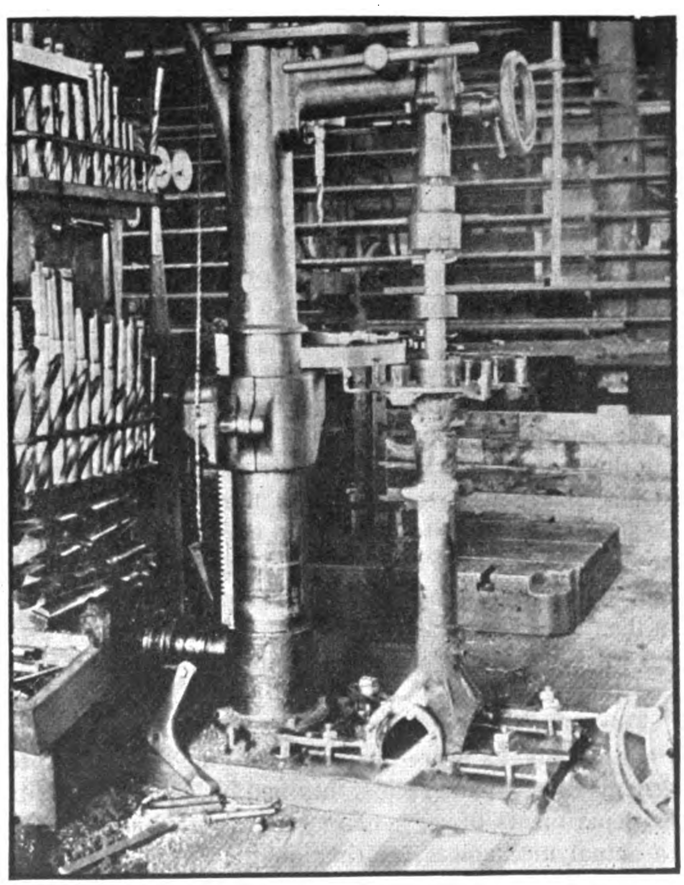
STROLLING through a machine shop not long ago, we saw an interesting job being done on the rear axle housings of a 1908 car. Long service had worn the wheel ends so large that no kind of doctoring up could make a roadable job and the shop was boring the holes out round again preparatory to putting in a sleeve that would decrease the size to where a standard roller bearing could be used. They were doing the work in a drill press and we took a snap shot at the set up.

Really no other machine could have done a similar job as easily. The boring bar has been raised to show more clearly—it's just a piece of steel turned small enough to go in the drill chuck and with a tool held by a set screw toward the lower end. The guide for the bar is seen above the tool—it is a piece of cast iron sliding on the boring bar and enlarged at the lower end to slip over the projecting (machined) part of the housing. Housings built up as this one is are



Section of Tool and Axle Set-Up Shown in the Photograph Below.

not easy to re-machine but this outfit does the work very easily and at very little tool expense. The work they produced was fine; a like operation on other cars for which no parts can be obtained would put them in first class shape again.



Drill Press Used For Boring Out Axle Bearing.

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Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

Entered as Second Class Matter January 15, 1921 at the Post Office at Cooperstown, N. Y., under act of March 3, 1897

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

Our Fifteenth Anniversary

IN March 1906 we published the first issue of the AUTOMOBILE DEALER AND REPAIRER and with this current issue we celebrate our fifteenth birthday. For fifteen years we have pursued the same Editorial policy and we are justly proud of this record because it is ample evidence that this magazine has a place of its own in history.

When our President, Mr. Richardson, first conceived the idea of publishing this magazine he realized that no trade paper could exist simply as a business proposition, but that it must satisfy a demand on the part of the public at large. He also realized that if the magazine were to be successful it must cover a field which previously had not been covered. Fifteen years ago the automobile was not considered a practical thing, it was a plaything and in the same class as airplanes are considered to-day; useful for some things but wholly impractical for commercial business.

The automobile industry was in its infancy and such trade papers as were published on the subject were general rather than specific, they had bicycle departments or departments of even more general information. As to actual mechanical information the A. D. R. was a pioneer in its field.

Our first issue was crude and its reading pages sadly limited but notwithstanding this, it was a purely mechanical paper. As time passed and we gained experience and as the automobile came into its own, this magazine grew but we have since had no cause to change our original policy—a mechanical paper for mechanics.

As time has passed and the demands for certain kinds of information has been required we have enlarged our field until, to-day we are publishing a mechanical magazine which is devoted to the interests of all those people who are concerned with the care and repair of automobiles.

We have said that our first magazine was crude, but there was an excuse for it. We were pioneers and without experience in this field. With each succeeding issue we feel that the magazine has improved. We are not satisfied with the A. D. R. as it is to-day for we know that it is far from the ideal but we can assure our readers that we are still working toward this ideal.

Anyone may be pardoned for being proud of past achievements unless one is content to rest upon one's laurels and feel that one has reached the ideal. We are proud of our past record, we are proud of our present magazine but this pride does not prevent us from realizing that we have much to learn and much still left to be accomplished.

We can promise our readers a better magazine in the future. We will strive to give them a paper devoted to their interests and to nothing else. We will try to give them practical mechanical information rather than theories and ideas of only a general interest.

During the year 1920 we published 493 pages of reading, actual pages of mechanical information and in addition to this we published 63 pages of reading matter pertaining to accessories in our "New and Useful Automobile Accessories" department. There is no text-book printed of 493 pages which can be purchased for the price of our magazine. We feel that we have accomplished something and look back with pride over our fifteen years of service.

A National Automobile Law

ONE of our prominent Judges, in speaking at a "Safety First" banquet not long ago said that this country did not need any more laws, that the records were filled with enough decisions, cases and laws to last us for many years to come and that what we needed most was, uniformity, common sense and enforcement of those laws which we had. In the slang of to-day we might remark that "he said a mouthful."

A few years ago we could meet local conditions by local legislation. We stayed at home, or at least we transacted most of our business and enjoyed our pleasures in one state. But with the popular use of the automobile, conditions have changed and we flit from one state to another regardless of distances. We seldom take a trip on Sunday without passing through another state than our own.

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Since we thus, automatically, become visitors to another state we must be subject to the laws of that state while we are in it. We may not be interested in general laws but we are vitally concerned with those laws bearing on the operation of the machines which we are visiting in. It is not the best thing for our temper to be stopped by a pompous traffic officer and handed a summons for breaking a law about which we know nothing. Nor do we care to receive a long lecture on law from such an officer, yet we are often obliged to listen to such a lecture after having driven into another state.

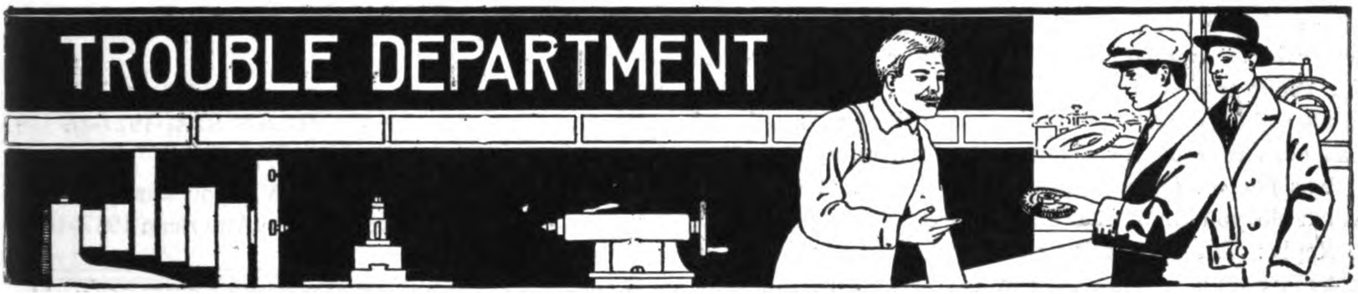
If our own state law specifies a certain speed which must not be exceeded and we journey to another state we may not feel it necessary to look up the traffic law in that state, yet we may break the law of that state unconsciously.

Conditions are such that we should have a uniform motor vehicle law in all states. It may not be practical to draw up a law which will cover every contingency in every state but a Federal law could be drawn to cover a majority of points.

Such a Federal law might cover speed limits in cities and towns at cross-overs and at intersecting streets. It might cover the point of equipment, brakes, lights, license numbers, warning signals, and so on. It might provide for the licensing of the driver and registration of the car and leave the question of fees and taxes to the decision of the various states.

In other words the Government would lay down the general automobile laws and the rest of the legal red tape could be cared for by the various states in any way that they might choose. Where it might be necessary to control traffic by state or municipal laws, such laws could be enacted.

Only by having a National Automobile Traffic Law can we hope to have uniformity.



KNOCK IN HUDSON

2961

From Chas. M. Boyle, Maine. I have a Hudson Super Six, 1917 Machine. A mechanic ground in the valves and took up the play in the connecting rod bearings. When the car was started we found that it had a bad knock. The mechanic thought that it was in the main bearings and therefore he took up the play in the main bearings. However, this did not help; the knock remained.

Can you tell me where the knock is? I am unable to tell whether this knock was present before the valves were ground in. I did not notice it. At any rate when the engine is first started, the knock is not very loud, but after it warms up, it is very noticeable when running idle. It seems to sound in different places and although several people have tried to locate it, nobody seems to be able to. When I place my hand on the rear of the crank case, I can feel quite a vibration.

Can you help me any from this description?

Reply: Your letter contains but meagre details and from it we are not able to form any satisfactory conclusion. As a first guess we would say that someone has left a nut, a bolt or some foreign matter inside the engine or transmission.

Since you say nothing about overhauling the transmission we assume that you have not touched that unit. Before running the engine we would advise you to remove the oil base and inspect the connecting rods and main bearings again. It is very possible that a connecting rod is loose.

Even the most expert repair man can be deceived when tightening connecting rods. It is possible to set up a cap so tightly that the engine can hardly be turned over, and yet within ten minutes after starting the engine, that particular bearing may be very loose. Such a condition is caused by the shims which project into the bearing area just enough to press against the journal. Perhaps the lower or upper shim may bend over and form a bearing surface of its own which is a few thousands of an inch above the other surfaces. After a short time this false surface wears off and the bearing is loose again. The same is true relative to main bearings.

If you are still at a loss to find the trouble, inspect the wrist pins and the camshaft bearings. Pay particular attention to the counterbalances on the crankshaft. Should any of these weights work loose there will be a knock and vibration.

If you can give us more details upon which to work we shall try to help you further.

A DIFFICULT FORD TROUBLE

2962

From Wm. Riegger, Maryland. I have just overhauled a 1917 Ford. I first put three new bands in the transmission case and put in new packing between the casing where it is bolted together. I adjusted the bands

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and they seem to be working O. K.

I then took the cylinder head off, cleaned out the carbon and ground the valves. I wanted to set the valves but discovered that they had too much play already. One valve had .05 another .07 and the other about .10 or .12. Of course, I do not know how much they set the valves on the Fords. I thought that they set them .03 to .05, but the owner told me to set them 1/64 of an inch. I told the man that that was too much play, and I should appreciate it if you would let me know what the valve clearance should be. I then put in new rings and as they seemed to work all right I reassembled the engine.

My trouble then commenced. I cranked the engine from 4 p. m. to 9 p. m. before it started. I cleaned out the carburetor, and put in four new spark plugs and when it did start I had to use a six volt battery to start it with, because that was the only way I could get the machine going. The other day the owner tried to start it again, and had the same results.

He tried heating the manifold with his electric iron, used hot water cloths, tried a hot brick on the manifold pipe and also put hot water on the carburetor and hot water in the radiator, and finally after fussing around for about two hours he started it. I believe the spark is all right, because when the engine finally started and had been running for about five or ten minutes so that it was heated, I found that it would start at one turn. What do you think is the matter?

Reply: The valve clearance in the Ford car should be not more than 1/32 of an inch (.031) and not less than 1/64 of an inch (0.16) and varies in different cars, depending upon how hot the machine operates on an average. It is better to set the clearance at 1/64 of an inch and run the engine until it has warmed to its average operating temperature. At that time the valves should be inspected and should have a clearance of at least .005 of an inch.

You will probably find that the intake valves can be set at .016 and the exhaust at about .025.

There are probably other troubles with your machine. See that the float level in the carburetor is not too low. The level should be not more than 1/8 of an inch below the needle valve opening. As a general rule a carburetor which can be flooded will operate satisfactorily. Test it in this manner—Pull out on the choker wire and crank the engine over for six half turns; then look at the carburetor. Gasoline should be dripping from it, showing that it is flooded.

From what you write we should judge that there is a leak in the intake line at some point between the cylinders and the carburetor. Be sure that all of the joints are tight. If the valve stems do not fit the guides, then you must install new guides or new valves or both.

We should advise you to carry a set of dry cells to be used for starting. Install a set of priming plugs, also.

Many a tap and reamer will be saved if a practice is made of testing pieces with a file before running the tool through—color is no indication of hardness or softness.

FORD LIGHTING TROUBLE

2963

From Moses Bill, New Hampshire. I have a 1920 Ford equipped with a starter and electric lights. I have not had any trouble with the starter, but the lights seem to go out all of the time. The bulbs burn out as quickly as I put them in.

I did not find any short circuit anywhere, but there is no cover on the battery box. Do you think I ought to put a cover over the batteries? I find that the bulbs burn out more quickly in damp weather or rain.

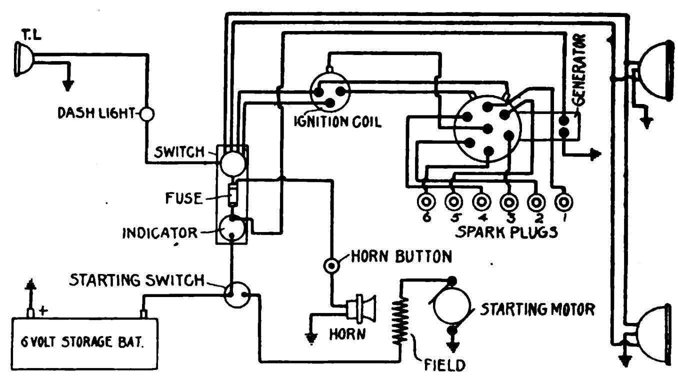
Reply: You will probably find that there is a loose connection at some point between the generator and the battery, or possibly a poor contact in the line. Go over all of the wiring carefully. If you find no trouble in the wiring we should advise you to consult a repair man because it will be necessary either to lower the charging rate or to adjust the cut-out. Unless you understand this subject thoroughly, you might damage either the generator or the battery in trying to make the adjustment yourself.

See that the battery has plenty of water.

WIRING OF AMERICAN SIX, 1917-18

2964

From W. Pawlowski, Ohio: Will you kindly publish a diagram of the wiring, used on the American 1917-18 car?



AMERICAN 1917-1918 -6-MODEL-A- WESTINGHOUSE SYSTEM

This is a six cylinder machine equipped with the Westinghouse system.

Reply: We print above diagram of the wiring which you request.

OILING TROUBLE ON CASE TRACTOR

2965

From J. R. Jolly, Nebraska. The following question refers to a Case tractor size 15/27, four cylinder, valve-in-head with removable cylinder walls, and force feed hollow crank shaft oiling system, carrying from four to eight pounds pressure.

I have two tractors that carry oil very badly. Reducing the pressure does not seem to help. The grooves in the pistons and rings wear very quickly. In one I have found them to wear as much as one-thousandth of an inch in twenty-four hours run, although the other is not

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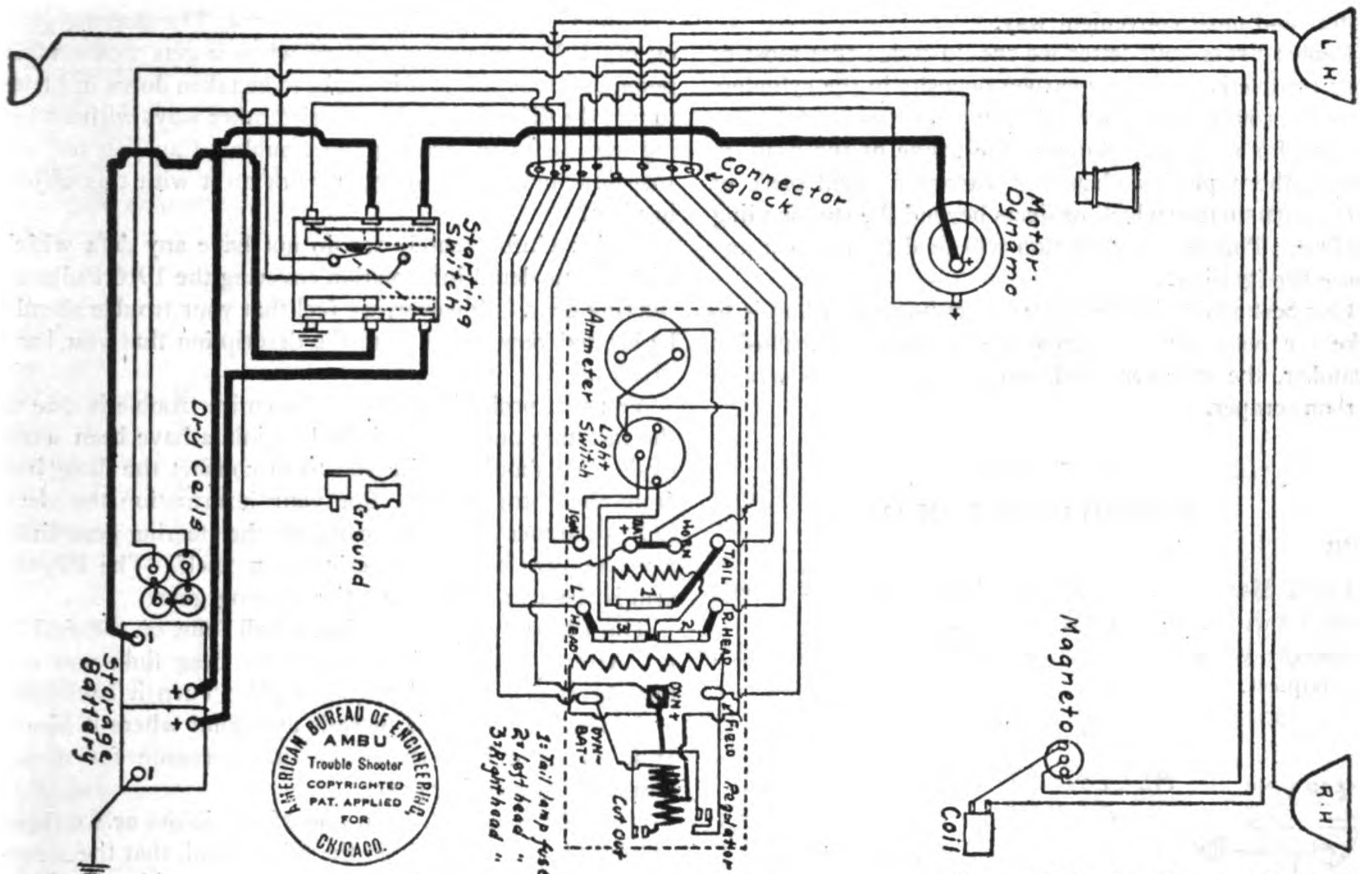
SIMMS-HUFF Maxwell 1916



Courtesy of American Bureau of Engineering.

so bad. I find that this does not apply on all of this company's tractors.

The oiling system seems to keep the cylinder walls covered with a heavy coat of oil. I have taken up all bearings and especially all end clearance, but I find that the crankshaft seems to throw an excessive amount of oil. Can you help me?

Reply: Your problem is very different from anything which we have ever encountered in that the facts contradict themselves. The excessive ring and groove wear would indicate lack of oil while other statements you make indicate oil to an excess. To a certain extent we are working in the dark because we do not have any detailed information concerning the construction of the Case Tractor.

Since the cylinders receive ample lubrication there is but one other conclusion to be derived from the facts. Evidently the machine is operated under adverse conditions, possibly in a smother of dust. Possibly the oil system is filled with grit. Possibly the oil itself is not pure. But at any rate, grit finds its way into the machine. The babbitt bearings would take care of a normal amount of grit but the cylinders would not. We should advise you to give the machine a complete overhaul, washing the parts with gasoline, replacing the old oil with pure lubricant. Install some sort of an air washing device upon the carburetor intake. See that the breather pipe and all other openings into the crank-case are protected from dust.

We would not advise the plugging of the oil ducts but would advise the lowering of the oil pressure to from two to four pounds. If the oiling trouble still exists, install a set of baffle plates between the crank-case and the cylinders. These baffle plates may be clamped between the cylinder blocks and the crank-case and slotted to admit the connecting rod.

WIRING OF MAXWELL 1916

2966

From Frank Borysewski, New York: Will you kindly publish the wiring diagram of the Maxwell 1916 automobile?

Reply: We print above diagram of the wiring on the Maxwell 1916 automobile, equipped with the Simms-Huff system.

REMOVING CARBON

2967

From H. E. Rocciola, New York: I have an Overland Model 83A, 1916, which I have purchased lately. I made a test on the State road and found that when speeded up to twenty-five miles or above the engine knocked. When running at about fifteen miles or so, it ran silently. I found that when I pulled the choker while it was knocking it seemed to quiet down somewhat.

I think there is some carbon in the engine which may be the cause of the knock. However, I should like your

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advice in the matter. If you think it is the carbon, will you let me know the best way to remove it? That is, the fastest and most convenient way.

Reply: From your letter we should judge that most of your trouble is caused by carbon deposits in the cylinders or some rough projection of metal, perhaps a defective casting for instance. Suppose the inside of the head, in one of the explosion chambers, carries a small piece of iron on its surface which projects beyond the surrounding surface. This small projection will tend to overheat and cause pre-ignition.

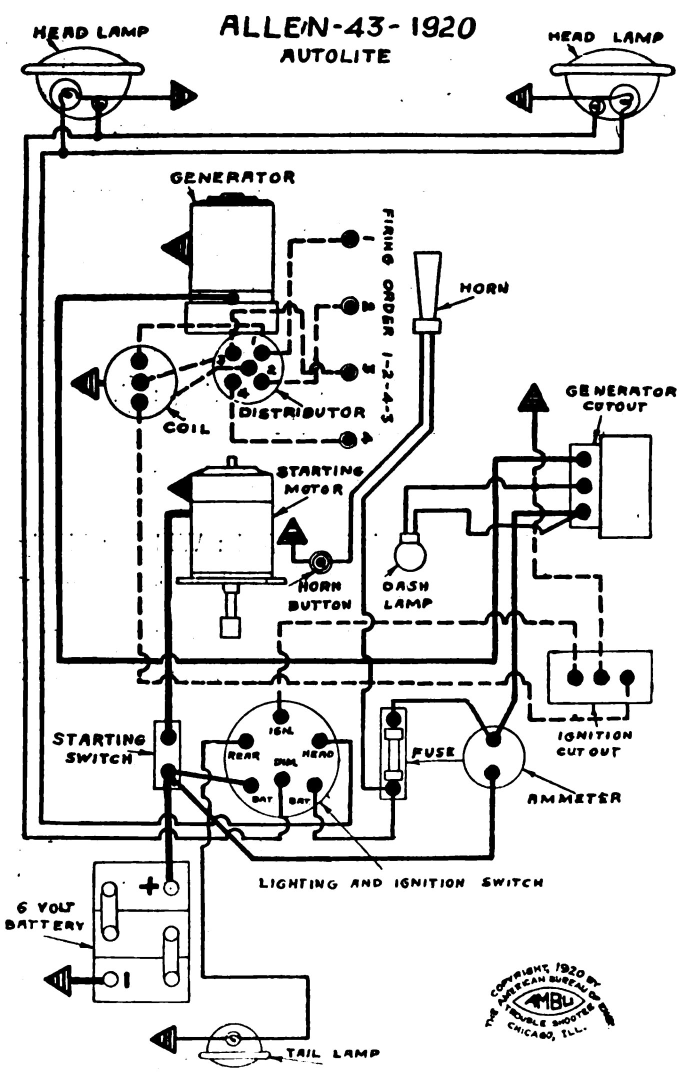
Our best advice in the matter of removing carbon is to take the head off the engine and scrape the explosion chamber, the cylinder head and the valve pores with a carbon scraper.

WIRING OF ALLEN 43

2968

From Martin H. Guthridge, Maine: Will you kindly print the wiring diagram of the Allen 43, 1920?

Reply: We print below diagram of the wiring which you request.



Courtesy of American Bureau of Engineering.

STEERING GEAR RUNS HARD

2969

From George V. Roberts, New York: The steering gear on my 1916 Pullman runs hard when it gets to a certain point, and it seems as if it ought to be taken down in order to find the difficulty, as I have tried other ways without being successful in locating the trouble. Can you tell me just how and where to begin work on it with this object in view?

Reply: Unfortunately we do not have any data which will give us detail information covering the 1916 Pullman steering gear. However, we feel that your trouble should be located very easily from the description that you have given us.

You will probably find that the entire trouble is due to the fact that one or all of the ball joints have been worn oval. We should advise you to disconnect the drag link from the Pitman arm. For your information the drag link is the member which connects the steering gear linkage members with the steering gear itself. The Pitman arm is the arm which is on the steering gear.

The Pitman arm usually has a ball joint on the end of it. After you have disconnected the drag link, you can test the steering wheel out by itself. Turn it backward and forward and see if there is any point where it binds. If it does not bind then there is no reason for disassembling the steering gear.

Look for your trouble in one of the joints as we have suggested. If you find, on the other hand, that the steering gear itself binds, then you can remove this unit from the car and inspect its parts.

CARBON TROUBLE

2970

From C. W. Shorman, North Dakota: I have an Overland Model 83, which is giving trouble by carbonizing very quickly. When I scrape all the carbon out it only runs about three hundred miles before it is all choked up again.

The compression is good, and the oil does not seem to work up past the pistons as the tops of the pistons are dry and the carbon is very dry and hard. The plugs do not foul up, and I only have to clean them about once in six months. On level roads the car runs well, but if I open the throttle suddenly the engine begins to knock and when going up hill it is almost necessary to close the throttle to stop the knocking. Retarding the spark does not seem to help. I have the same carburetor that was on the car when I bought it, but I have installed a Wilmo manifold.

I use Gargoil (Arctic grade) I tried using a heavier oil this summer, but I could not see that it made much difference. The engine consumes a normal amount of oil. On a cold day (zero weather) I can climb any hill around here on high without a knock. The radiator does not get very hot—it never boils.

I am using as lean a mixture as I can since I have to pull out the choker if I want the engine to pick up quickly after running very slowly, and sometimes after climbing

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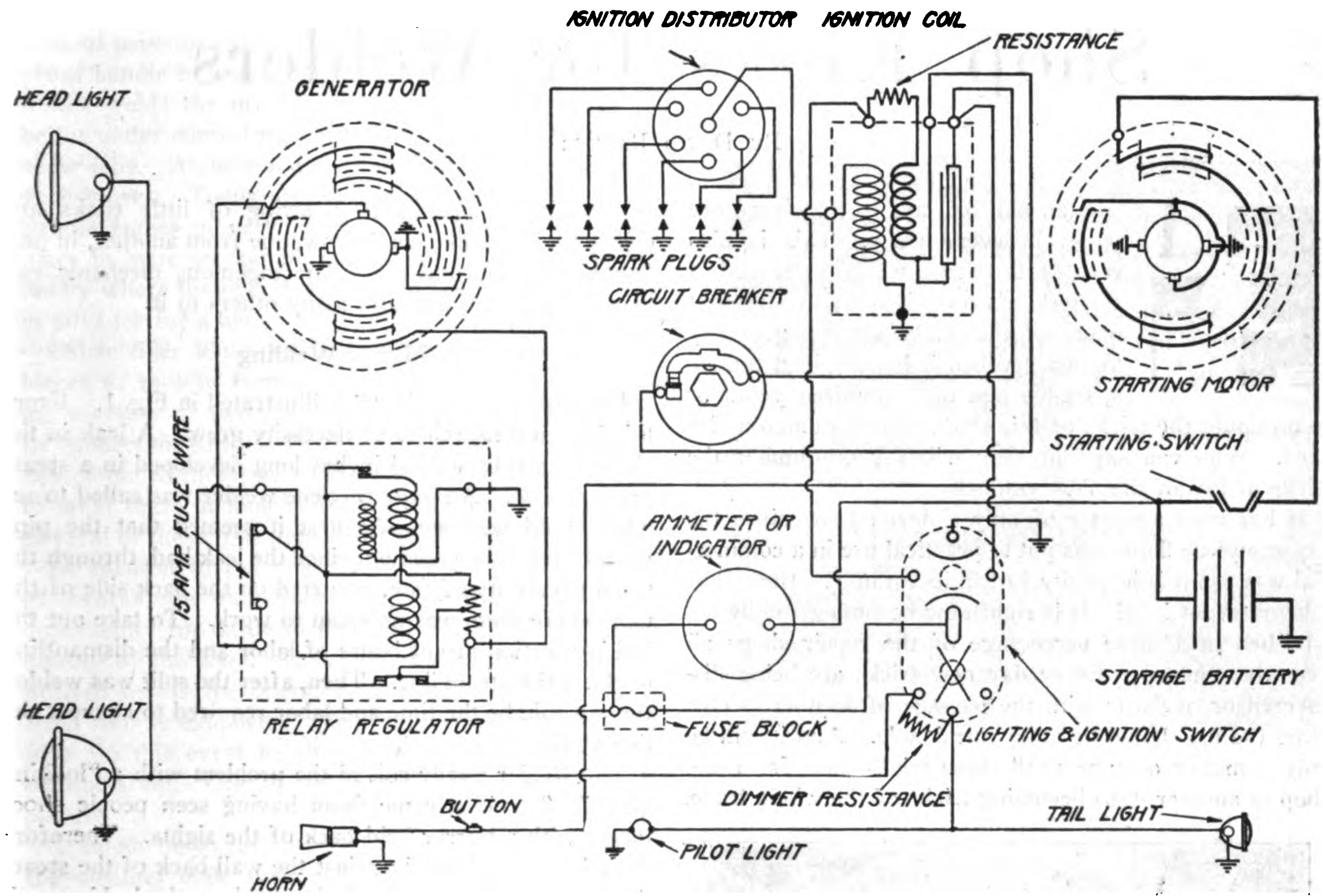

Courtesy of Remy Electric Co. Wiring of Oakland 1916.

a steep grade. I change the oil in the crank case regularly.

Reply: From your description of the carbon formation, we should judge that this deposit is due to the carbon formation from the fuel rather than from the lubricant. We should advise you to try some other grade of fuel than what you are using now.

We should also advise you to install some sort of a water vapor attachment to the manifold and occasionally or about every five hundred miles feed about one-half a cup full of kerosene oil through the water vapor attachment.

If you still have trouble, try another make of carburetor.

WIRING OF OAKLAND, 1916

2971

From Wm. Dunham, New York: Will you please print the diagram of the wiring used on the Oakland 1916 32-B, Remy ignition? There is a difficulty somewheres, because the coil heats. Can you tell me how I can tell the primary from the secondary post on a coil?

Reply: We print below wiring diagram of the Oakland 1916 32-B.

You can tell the primary posts from the secondary by adopting the following procedure.

Take the two wires from a storage battery and touch them to the three or four coil posts in pairs of two, at the same time placing a heavy object such as a hammer, near to the other two posts. For convenience we will consider that the coil posts are numbered one, two, three and four. First connect one terminal of the storage battery with terminal number one. Place a hammer or any other object near to the coil terminals three and four and touch the other battery terminal to coil terminal number two. If a spark leaps across to the hammer you will know that the terminals three and four are secondary terminals. Adopt the same procedure in testing out all of the posts in pairs until the secondary terminals are found.

ANOTHER USE FOR 'EM

(From a Classified Ad Column)

Wanted—White man to milk and run Ford car; one mile south of Fifteenth on Lewis. Devlin.

A flivver in Kankakee, Ill., broke the arms of four persons, who attempted to crank it, in less than a week. That's what comes of crossing a bicycle with a mule. —Utica Tribune.

NO RE-PETER

Judge—"What is the charge?"

Policeman—"Intoxicated, your honor."

Judge (to prisoner)—"What's your name?"

Prisoner—"Peter Gunn, sir."

Judge—"Well, Gunn, I'll discharge you this time, but you musn't get loaded again."

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Shop Kinks for Welders

By David Baxter

IT IS an old, old, axiom that there are tricks in every trade. This is also true of the flame welder's trade, but the welder's trade is still so young that many of the tricks are not generally known. When it has attained the respectable age of a hundred years or so no doubt the tricks of this trade will be numerous indeed. Who can say but they will far outnumber the tricks of lots of the older trades?

It has been a matter of only a dozen years since the oxy-acetylene flame was put to practical use in a commercial way; so it is in reality just in its infancy. But, what a lusty infant it is! It is right now becoming solidly established in a large percentage of the repair shops all over the country. Every day new tricks are being discovered or devised; with the passage of another twelve years the list should be quite formidable. And it will be only a matter of time until these tricks pass from one shop to another, thus becoming tricks of the whole trade.

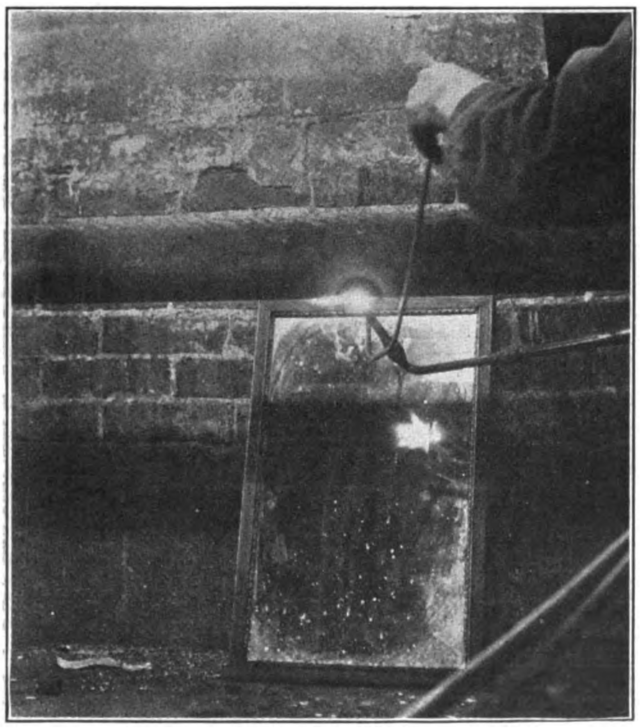

Figure 1, Welding in close quarters with the aid of a mirror.

It was with this line of thought in mind that this article was conceived. The main purpose of this discussion, then, shall be to pass along a number of little ideas that have produced big results in the shops where they were devised. It is hoped they will prove worthy of at least a trial in other welding establishments. For the time and labor saved are only one item in the value of each idea; one trick will always beget others which will in turn beget more until a string of little tricks are evolved. Ideas like coral grow, one from another, in any line of human endeavor. The ingenious mechanic can take a single idea and add many others to it.

Mirror Welding

Take for instance the trick illustrated in Fig. 1. From this idea several others of necessity grew. A leak in the shape of a split several inches long developed in a steam pressure line. An oxy-acetylene welder was called to see what could be done. At first it seemed that the pipe would have to be taken out since the leak had, through the usual perversity of fate, occurred on the back side of the pipe where there was no room to work. To take out the leaking section meant hours of labor and the dismantling of the entire steam line. Then, after the split was welded there would be the time and labor required to connect the line again.

The welder finally solved the problem with a "looking glass." The idea came from having seen people shoot target with a mirror held back of the sights. Therefore the mirror was leaned against the wall back of the steam line at such angle as would clearly show the leaking split reflected in the glass. This of course necessitated welding upside down and backward. That is, the operator was forced to watch by eye the progress of the welding in the mirror and keep the manipulation of the flame and filler rod in his mind. This is rather awkward at first because the mirror shows the work backward.

Special Filler Rods

When the operator came to the actual flushing of the metal he found that an ordinary filler rod would not do. Here was where one idea sprung from another: A special rod was essential to the success of the mirror trick, so a rod was bent in reverse angles as shown in the picture. With this rod the upside-down-backward weld was readily achieved.

All of which leads quite naturally and easily to special rods for other kinds of jobs. Fig. 2 exhibits several examples of special filler rods. The steel and brass rods are readily bent to most any desired shape while the cast rods are constructed by welding pieces of filler together. With these odd-shaped rods the welder can make almost any conceivable kind of weld; welds that would be impossible with an ordinary straight filler. For the welding of deep pockets or behind cross sections of the castings; in corners or narrow slots; in close quarters such as in welding scored cylinders or bored holes; for making welds on autos or trucks without dismantling the defective part; in fact the cases are innumerable where a special filler rod will facilitate the welding.

In Fig. 2 are also illustrated several filler tricks besides

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the special angle rods. One of these consists of wrapping pads of asbestos paper around the rod to serve as a heatproof handle to enable the welder to grasp the rod closer to the weld; the movement is then more accurate and better under control than when held close to the weld on some jobs. A short rod soon gets too hot to hold, even with gloves. Tongs are awkward, so that the asbestos handle comes in very handy. The asbestos is held in place by wire so that it cannot slip. This trick is very handy where the operator wants to keep several rods hot in advance for a heavy job.

Other filler kinks are the welding together of short pieces of rods to form a full length rod, and the twisting together of two light wires to form a heavier filler. In connection with the first, it may be well to caution the novice not to throw away the short bits of filler rods but to weld them in long rods or to the end of long rods. Several of these rods are shown in the picture.

In relation to twisting rods together it may be well to mention the fact that this procedure offers greater opportunity for oxide to form, which tends to lower the quality of the weld. It is a trick that ought not to be utilized unless the operator finds his supply of certain sized rods is exhausted, when he needs them for a rush job. In this event he should use utmost care in flame manipulation. One of the twisted rods is shown in the picture.

It might be worth while in passing to call attention to the welding table shown in this picture. The table is constructed of angle iron welded together. A leveling plate forms the top. It is very convenient for small repair work, and one that is easily made by the welder in his own shop.

Another trick of the welders' trade that might very well come under the heading of special filler rods is shown in operation by Fig. 3. This idea consists of using a piece of chilled cast iron as filler material. In this connection a piece of discarded feed grinder is used. The burrs of shellers, grinders, and crushers are usually made of the hardest kind of cast iron and will lend a glassy wearing surface to anything to which they may be welded. It is not necessary to have this metal in the form of rods for it may be applied in the manner indicated in the picture; the chilled iron applied direct, from the grinder burr. It forms an almost wear-proof surface when applied to push rods, tappets, polishing irons, scrapers. It will adhere to steel as well as iron. To apply: the steel is first brought to a molten stage, then the chilled iron is melted onto it. The chilled filler cannot be machined, so that only a slight surplus should be the chilled iron is melted onto it. The chilled filler canadded. To work is to size and shape, the chilled filler must be ground on a carborundum wheel.

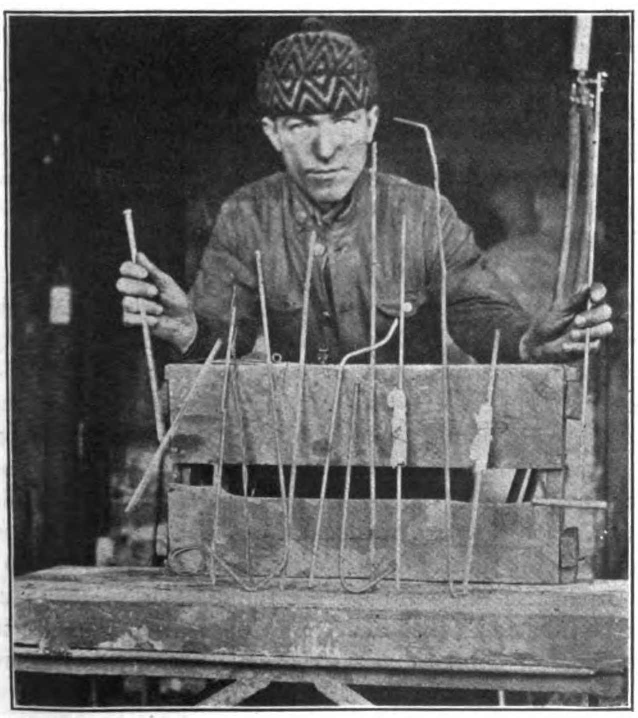

Figure 2, An Assortment of special filler rods.

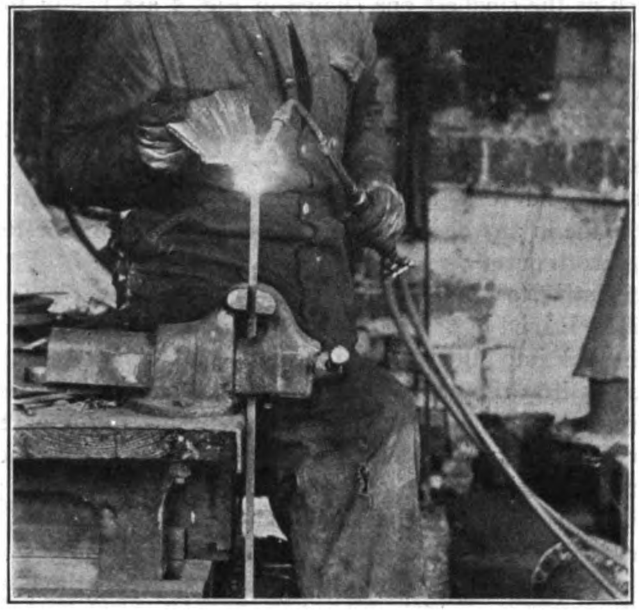

Figure 3, Using a piece of chilled cast iron for filler metal.

Tricks With Asbestos

Most welders have learned that asbestos is indispensable in the welding shop. It can be used in so many different ways that it is almost an absolute necessity. They have learned also that it is quite expensive because it is extremely fragile when hot or after being heated. After using a sheet of asbestos paper to cover a heating job the welder finds he must handle it gently indeed, or it will crumble in pieces. Of course this is not all actual waste because the scraps are useful in a number of ways. But most welders would like to be able to save more of it in sheet form.

It was this desire that led to the device illustrated in Fig. 4. This trick consisted of placing a sheet or two of asbestos between two strips of wire netting. The loose ends of the wire are bent to clamp the two pieces together and hold the asbestos smooth. The device forms a movable shield which may be made in several sizes for different purposes. When the sheets finally become

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dilapidated it is easy to remove them and replace them, with new asbestos.

These pads may be used as shields to protect the welder from the heat of a preheated job. Or, they may be used to cover a casting while it is being heated. Small shields such as the smallest one shown in Fig. 4 are handy for covering small openings through which a job is welded in the preheating furnace.

A variation of the idea would be to construct a small pre-heating oven of wire netting and cover it with asbestos paper, then with an outer covering of the netting. This would form a light portable preheater and could be made in any desired shape or size; when the asbestos was worn out it could be replaced at small cost.

Relative to other uses for scrap asbestos paper a few will be named in order to give the reader an idea that he can work into other ways to keep from wasting it. First a sheet iron receptacle should be kept at hand where all scraps of the asbestos are deposited. This forms a reserve supply and a use for the scraps at the same time. Small welded jobs that need slow cooling are quickly placed in the iron box and covered deep in the scrap. If they are buried deeply enough there will be no danger of contraction cracks because the asbestos prevents the heat from escaping rapidly.

Another use for scrap asbestos is to mix it with water or oil to the consistency of dough. This asbestos-putty,

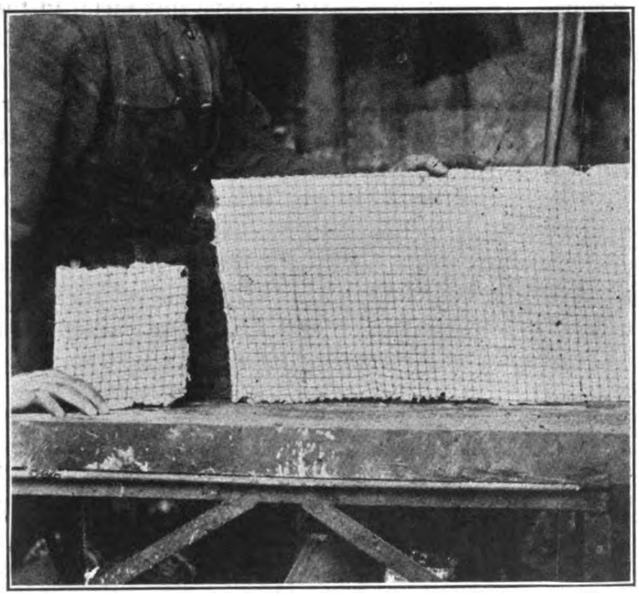

Figure 4, Asbestos shields promote efficiency of the welder by protecting him from the heat.

as it might be called, can be used in the place of clay on the babbitting of motor bearings. It is also used to prevent babbitt from melting out of cylinder block bearings while welding small cracks or outside fractures; the asbestos putty is piled up around the bearing and a cup-like depression is made in it. Water is poured into this cup to drain out of a small outlet at the bottom. The circulation of cold water prevents the bearing from being melted. The same idea may be used in a little different way to confine or localize the pre-heating on some kinds of jobs, such as confining the heat to certain portions of a wheel rim. The putty is piled up around the rim and kept cold with water thus confining the heat to the space between the two batches on either side.

Asbestos scrap is also useful for packing the boxes of auto engine cylinders, previous to preheating them. This prevents the preheating flames from coming in direct contact with the bore metal. This idea is particularly useful when welding cylinder blocks which must be heated and welded with the bores perpendicular in the fire, or where the flame would rise directly into the bores. The

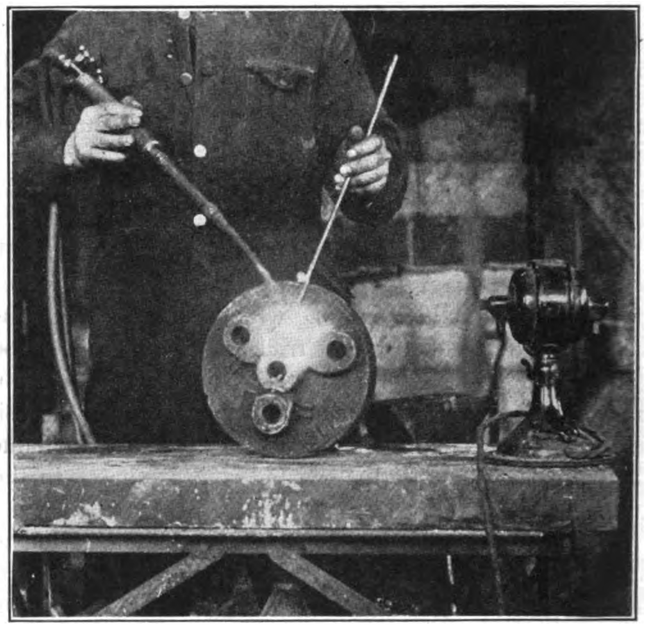

Figure 5, An electric fan of the common house variety blows away the fumes of a welded casting.

cylinders are not packed tightly with the asbestos scrap but are completely filled with it, loosely packed. This permits the heat to circulate but prevents the flames from injuring the bore.

Health Hints

In Fig 5 is shown an idea that is capable of several variations. A common electric fan is arranged to blow away the fumes of burning grease or other substance to prevent the torch operator from breathing them. This is particularly useful when welding brass since the fumes of this metal are poisonous and are sometimes extremely injurious to the health of the welder. Nearly all brass contains zinc and lead which burns easily due to their low melting point. The fumes of these metals nearly always rise in considerable quantities when the welding flame is applied. If they are not warded off in some way they are bound to be inhaled by the torch operator. Sometimes the effect is an attack of what is known as the "brass chills." This usually results in considerable suffering on the part of the victim; often causing him to be in bed for several days.

An electric fan will blow the fumes aside so they will not be inhaled as they arise from the melting metal. If the operator cares to go a step further with this idea he can arrange to have the fan blow the fumes toward a suction ventilator by which they are entirely removed

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from the shop. A well ventilated shop will pay in increased efficiency more than the cost of the ventilators.

The fan may be used in several ways besides blowing aside fumes. When welding a long job on a hot day the operator will find it a great comfort if he arranges to have the fan blow directly upon him; the fresh current of air will neutralize the heat of the weld. Then too, the fan is useful in enlivening a heavy charcoal preheater fire, or to keep it burning briskly during the preheating process, especially in cases where the circulation of air is poor, such as when welding large crank housings or heavy cylinder blocks which are preheated in fire brick ovens. The welder should be careful, however, about directing the current of cold air across or against a heated casting, else he may unbalance the expansion and cause the metal to crack.

If one part of a casting is cooled suddenly while the rest is red hot it will often cause a crack to develop, due to the sudden contraction in the colled part. Therefore when endeavoring to blow the fumes away the welder should be certain the casting is of such shape that cold air will not endanger it. Or he should raise the fan high enough that the cool air will not strike the job.

Now in closing this discussion of trade tricks a suggestion or two in regards to the way to evolve new tricks may be appropriate. This is readily simmered down to two general methods, the first of which is to travel. If every welder could travel from shop to shop for a year or so he could see how the other fellow did it he could no doubt learn and invent many new tricks. That method would be rather expensive to say the least, so the average torch operator must content himself with other means of learning the tricks of his trade. This method is simple indeed, for it consists merely of reading books and trade papers. Every mechanic should read thoroughly at least one magazine dealing with his particular line of work. By all means he should remember that the advertisements frequently furnish lots of little tricks of the trade.

New and Useful Automobile Accessories

Badger Mfg. Co. to Expand

With the coming of the new year, the Badger Mfg. Corp., Milwaukee, Wis., disclose their plans which have been consummated for some time past and which call for a considerable expansion in both their manufacturing and sales facilities.

Anticipating a quick return to normal business conditions and to be in position to serve their trade promptly, a new factory building has been leased for a term of years. This new building is located at Clinton & Oregon Streets. It is a three-story structure with a large roomy basement, built of cement and brick exceptionally well-lighted and ventilated—in fact, ideal in every way for the manufacturing of the equipment made by this concern.

With the leasing of this new plant, the two factories used up to the present time will be vacated and the entire organization brought together under one roof, which will overcome the inconvenience experienced in operating two plants in different parts of the city.

A corps of men has already been put to work to get the new plant into shape. Arrangements have also been made to move in such a way that there will be no interruption of active production. It is hoped to have all machinery installed and be in complete production in the new plant by the end of January.

Lower Prices on Cord Tires

Reduced prices to the distributer and dealer on Cord Tires for the small car—and, consequently, lower prices to the Consumer—has just been announced by the Master Tire & Rubber Company of Dayton, Ohio.

This reduction in price is the result of the policy adopted in the beginning by The Master Tire & Rubber Co. of standardizing, specializing and concentrating on a quality of Cord Tire for such cars as Fords, Chevrolets, Maxwells, Briscoes, Dorts and Light Overland 4's. The Company will make nothing else but this one size and quality.

This company took all the information and data which they received in perfecting the Cord Tire for airplanes, coupled with their long experience in making Cord tires for automobiles, and designed the Master Cord for the small car. As a result the Master Cord is unique in itself—not a miniature of a large Cord tire, but actually a tire that was built from the ground up for a special purpose and service. The company was organized in June, 1919, for the purpose of manufacturing these tires in a 30 x 3½ size. It was originally capitalized for $300,000 but on January 1st., 1920, the capital stock was increased to $1,000,000. A factory was immediately built and the first unit is now operating with a production of 250 tires a day which will gradually be increased to 500 tires a day. Next spring the company will break ground for its second unit which will be a six story structure and will have a capacity of 2,000 tires daily.

Severe and rigid road tests of every description have proven the durability and ruggedness of the Master Tire and the mileage records it makes on the cars of drivers is further proof of the stamina of this new tire. Dealers who are handling the tire say that it has met with almost instant favor with their customers and they are practically unanimous in the statement that there is a big future ahead for a tire of this size and quality.

Remarkable Sale

The No-Leak-O Piston Ring Co., Baltimore, Md., has just announced a sale which is remarkable. Recently this company sold an entire car load of rings to a *single* jobber, an accomplishment which has never been heard of before in the piston ring business.

When one understands the size of a car load and the size of the average piston ring, one can realize the magnitude of a transaction like this.

It is said that the feature of the No-Leak-O ring, the 45 degree angle groove, has proved a favorable influence in selling these rings.

The No-Leak-O Co. publishes several interesting booklets in regard to their No-Leak-O rings, three of which are named below. "The Piston Ring Problem And Its Solutions," "Know the Facts About Grooved Piston Rings," and "Our Business Creed."

They are very interesting and throw a light on the splendid way in which this company conducts its business.

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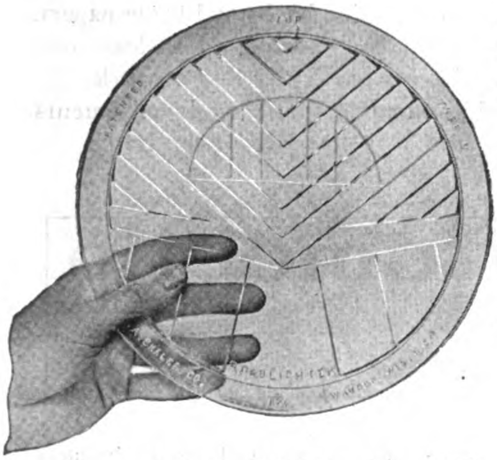
Shaler Roadlighter

The Shaler Roadlighter is distinguished from all other anti-glare lenses by the fact that instead of merely complying with all headlamp laws by stopping glare, which could easily be done without any lens at all, it distributes all of the light from the headlamps over a carefully chosen area of the road. A great many automobile engineers have pronounced its light to be the best driving light they have ever seen, regardless of whether a lens was used or not.

It throws a light on the road that looks as if it came from a pair of regular headlamps plus a pair of spotlights. The distance light is as strong or stronger than with plain glass, and there is an especially brilliant illumination of the edges



of the road that enables the user of this lens to see plainly, even while passing other cars whose headlamps glare. This efficiency is due to the fact that instead of simply bending the light down and fanning it out sideways as is done with all other anti-glare devices, the Shaler Roadlighter divides the light into three overlapping beams which are thrown toward the road at different angles so as to give a broad smooth light for the first hundred feet and a narrower, intense light far in the distance.

The efficiency of the Shaler as a glare-stopping device has been proved beyond a question by its receiving the highest candlepower rating allowed by law in every official state test—an exclusive Shaler performance.

An almost unanimous demand in a few of the states which have recently adopted the Standard Headlamp Law has, up to the present, taken the entire output of the Shaler Co., of Waupun, Wis., the manufacturers, and prevented them from introducing it generally. Ample production is finally assured and prompt deliveries are now being made.

Edelmann Spotlight

A very attractive neat little lamp is being manufactured by E. Edelmann & Co., 2642 N. Crawford Ave., Chicago, Illinois. It is called the Edelmann Spotlight, and the manufacturers claim that it will throw a light over two hundred and fifty feet.

This single shell reflector spotlight is very reasonably priced, and it will be to the advantage of owners and dealers to investigate. This company also manufactures the Break-Not Battery Tester, the Jumbo Grease Gun and Four-In-One Screw Driver.

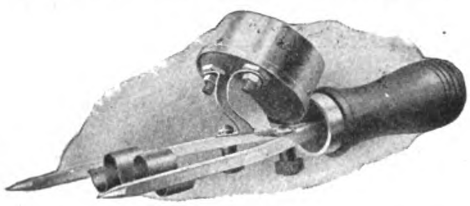
Gardner Two-Stage Air Compressor

An Air Compressor which is said to embrace three very important features is distributed by C. A. Dickerson, 624 Fisher Building, Chicago, Illinois, and called the "Gardner Two-Stage Air Compressor." The lubrication system of this machine is very even and thorough and insures pure, oil-free air.

The piston in the cylinder of the Gardner Two-Stage Air Compressor has only one-sixty-fourth of an inch leeway at the end of a stroke, and the makers claim that this means direct compression. The Gardner-Governor Company, the builders of the Gardner Two-Stage Air Compressor have been giving satisfaction to many customers for sixty years, and this fact should convince everyone of the dependability of their products. Garage owners should write for the data and information regarding the Gardner Two-Stage Air Compressor, which will show them how they can increase their garage business.

Weston Model 453 Heavy Discharge Battery Tester

The Model 453 Heavy Discharge Battery Tester is intended for testing the voltage of each cell of the battery while a relatively heavy current is flowing and consists of a well designed substantial



prod upon which is mounted a direct-current voltmeter having a range of 3-0-3 volts.

The prod has two prongs securely fastened in a wooden handle which are spaced so that they can be pressed into the cell terminals of the standard automotive batteries. Connected between the prongs is a special alloy-conducting

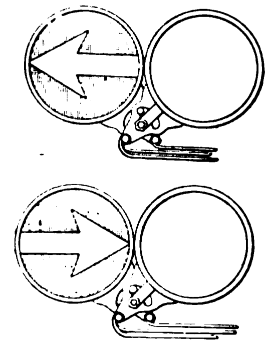
strip of approximately 0.01 ohm resistance, through which approximately 200 amperes will flow when 2 volts is applied across the prod.

The voltmeter is a Weston Model 301 with a legible and easily read scale. The instrument and prod are furnished, in nickel finish only and are manufactured by the Weston Electrical Instrument Co. of Newark, N. J.

The Fow-Toor Signal

The manufacturers of the Fow-Toor Signal claim that besides being a front and rear, day and night signal, this device also embodies a rear view mirror, a parking light, a trouble lamp socket, and a spot lamp bracket, thus making a combination of six necessary accessories in one. This signal is simple in construction and all parts are standardized.

It is claimed that there is nothing which can get out of order and it is readily attachable to any type of car, open or closed. It is very simple in construction and the fact that the few parts are ingeniously made, makes this device appeal to car owners. It is attached to and stands out from the wind shield, where the driver can always see at a glance, whether he is giving the correct signal display.



The entire device weighs only four and one-half pounds, and the upkeep is negligible. There are no switches, springs or wires to get out of order. Operation is effected through the use of small handles, conveniently arranged in a small space, there being a separate handle for right, left and stop.

It will undoubtedly pay readers of the AUTOMOBILE DEALER AND REPAIRER to investigate this signal, which is manufactured by Toor Products, Inc., 29 West 34th Street, New York City.

The Milwaukee Timer

At the present time many owners are overhauling their Fords, and they should not overlook the timer, because they cannot expect perfect ignition if the timer is not in good condition.

The Milwaukee Timer for Fords is a very fine device, being manufactured by men who have been ignition specialists for the last fifteen years. The Milwaukee is built simply and sturdily. It has only two moving parts.

It will pay dealers to investigate this timer, and if they write to the Milwaukee Auto Engine & Supply Co., Milwaukee, Wisconsin, they will be sure of receiving prompt attention.

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Marvel Products

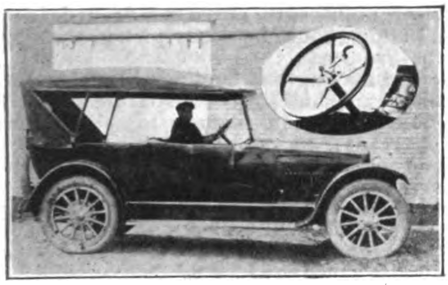
The Marvel Machine Co., of Minneapolis, Minn., manufactures the Marco Piston which is claimed to be light in weight and substantial in construction. The manufacturers feel that with the Marco Piston one is guarded against loss of compression, fouled spark plugs, piston slap, sticking and excessive pumping of oil. The piston is made of selected, close-grained gray iron. Detailed information can be obtained by writing to the Department of Piston Sales, 616 So. Michigan Avenue, Chicago, Ill.

The Marvel Machine Co. also manufactures the Marvel Cylinder Reboring Machines which are very well known. They are power driven, automatic and easily operated. Information in regard to this machine can be obtained from the Marvel Machinery Co., Loan & Trust Building, Minneapolis, Minn.

The Gas-Electric Drive

We picture herewith an interesting application of electric drive as perfected by the Smith-Brandon Corpn. of Newport City, Vermont. In the illustration is shown a stock model, Nash 681 car, from which have been removed the clutch, the transmission gear-set, the generator and electric motor and in place of these units a Smith-Brandon electric drive.

This type of drive consists of a motor-dynamo unit which takes the place of the gear-set. The action of this unit is controlled entirely from a hand lever on



the steering wheel quadrant. In other words, this controlling lever takes the place of the clutch pedal and the gear-shift handle. It is only necessary to move the lever to the requisite position and the car moves backward or forward as desired. The maximum and minimum speed of the car is controlled, also, by means of the throttle as in any gas car.

In practice the device works as follows. The control lever is placed at the "start" position and the ignition switch thrown on. Current passes from the storage battery to the motor-dynamo unit and turns the engine over until that unit is functioning, the control lever is then thrown to neutral again and the engine will idle normally, until the car is to be started. The lever is then moved to low, forward, and the car will move forward in that speed, and so on until high is reached.

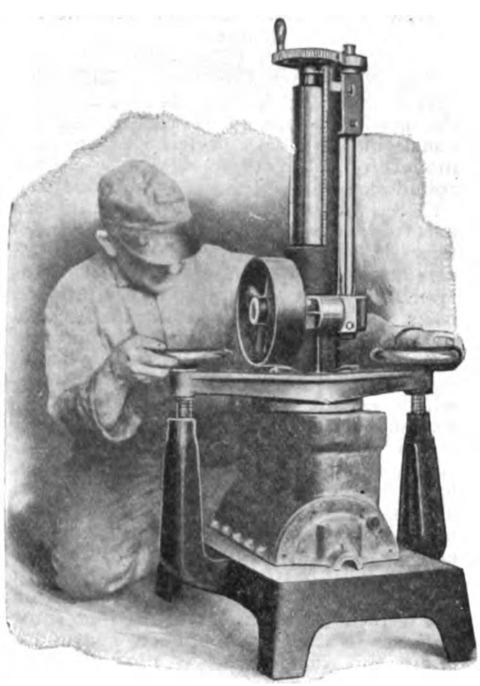
Granted Design Patent

The Hudson Motor Specialties Company, 1932-34 Arch Street, Philadelphia, Pa., manufacturers of the Hudson Crank Case Repair Arm for Ford Cars have been granted a design patent for Crank Case Repair Arms.

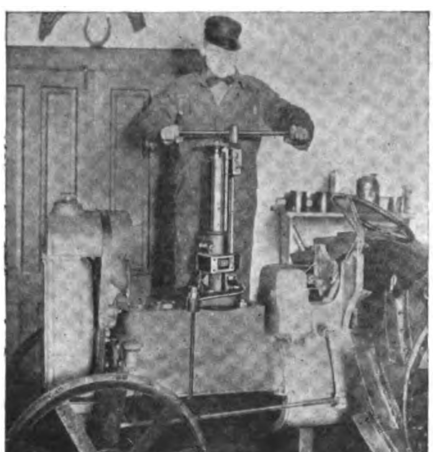
Storm "Type M" Reboring Machine

The Storm "Type M" Reboring Machine, which is now being offered to the trade is said to possess a number of unique features and advantages, making it admirably adapted to the needs of shops doing cylinder reboring of all kinds.

The Main Body is a one piece, heavy, casting and supports the boring bar, feeding and driving mechanism. The construction provides two heavy, adjustable bearings in which the boring bar operates. The boring bar is of hollow, carbon steel, hardened and ground,



and having a travel of 14 inches. It is actuated by means of cut spiral gears and the feed is obtained through heavy, internal screw and upper feed gear, as shown. The bar supports the cutter heads, which are not shown. The Cutter Heads are of the Storm Patented Six Cutter Type, which have universal ad-



justment by means of a center cutter adjuster, so that they cut to any desired size within the capacity of the Machine.

The Machine is supported by heavy base provided with clamp yoke and clamping screws. It rides or floats free in this clamp and is self-centering. A valuable feature of this Tool is its adaptability to do different methods of drive. It is regularly furnished with a connection for drill press but can also be furnished with pulley for belt or for motor drive. It will be noted that the Machine does not set directly in front of or over the drill press base but instead sets to one side so that it does not interfere with use of the drill press for other work. Furthermore, it is back geared so that it may be used in connection with any ordinary 20-inch drill press.

Each Machine is also provided with double end wrench for operating by hand so that it may be removed from the base and used as illustrated for reboring motors without removing them from the chassis, by merely withdrawing two small pins in the clamping device.

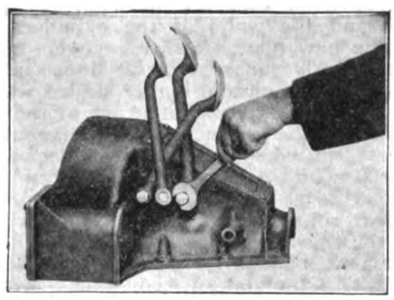
The cut shows a Fordson block being rebored in this manner. Users find this very convenient not only for tractors but for marine engines, trucks and passenger cars.

The total capacity of the Machine is from 2⅝ to 6½ inches and its weight approximately 300 lbs. It is manufactured by the Storm Mfg. Company, Minneapolis, Minn.

Michon Brake and Reverse Band Adjusters

A device has recently been placed on the market which fills a long felt need. It is a brake and reverse band device manufactured by the Michon Mfg. Co., 124 N. Erie Street, Toledo, Ohio.

When this device is used, the manufacturers claim, it is no longer necessary for the Ford driver to remove the transmission case cover to effect the ad-



justment of the brake and reverse bands, since the adjustment lock nuts for both bands are carried through on a shaft through the outside of the transmission case. This is done with the clutch band adjustment only, on the Ford car. With this device all three bands may be adjusted by the application of a wrench to the proper bolts outside of the transmission case.

Every one knows that one of the dirtiest jobs on a Ford is that of removing the transmission cover and plunging the hand and a small wrench into the oily recesses of the housing, and it is no easy matter to attempt to connect with the proper nut lock before the wrench slips from the fingers and disappears into the mechanism of the clutch, fly wheel and the Ford magneto.

It would seem that when these adjusters are attached, no trouble of this kind is met with. When this device is used a job which might be neglected because of this unpleasantness is easily accomplished, and thus avoids possible accidents. It probably will be to the readers' advantage to investigate this device.

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Progress of Stark Inland

Optimism and a full-speed-ahead policy for 1921 have been adopted by the officers and employees of the Stark-Inland Machine Works, manufacturers of the Stark-Inland Spiral Cut One Piece Piston Ring, who recently celebrated their fifth anniversary of the company by removal to new and larger quarters. While many plants connected with the automotive industry were temporarily closed down during the past few months, due to general business depression, it has been a matter of comment that the wheels of the Stark-Inland organization did not stop turning, with the exception of a brief period occasioned by the removal and installation of machinery in the new factory at Jefferson and Lucas Aves.

History has been made by the Company ever since it was organized in the early part of 1916. The original force consisted of twenty workmen who were employed in modest quarters occupying less than 3,000 square feet. Five years have passed, and today the Stark-Inland One Piece Piston Ring, to the number of 6,000,000, is used in practically every part of the world; in fact, wherever automobiles, trucks, tractors, motorcycles, locomotives, stationary gas engines, marine engines, air compressors, refrigerating machines, aeroplanes and mining machinery are used.

To accomplish the phenomenal results obtained for this product, credit is given by the management to advertising as being largely responsible. Judicious use of printers' ink was employed in various media to tell the world about this bond of expanding metal around the piston, which is claimed to prevent the gas or steam from escaping between the piston and the walls of the cylinder.

The new plant facilities cover more than 70,000 square feet of floor space, and several hundred highly skilled workers are employed to take care of the demand for the product. The management started in business with a capital of $30,000.00, while the present capitalization is $2,000,000.00.

Not content with the unusual success of the Spiral Cut Piston Ring, the management recently developed the Stark Oiless, a popular priced, quick-seating Piston Ring placed on the market to enable dealers to supply the demand for a ring of this type. This ring is made on an entirely new principle—having the turned finish or quick-seating feature fully developed. It adapts itself quickly to the contour of the cylinder, by wearing in with less delay. The oil groove at the shoulder "scrapes the oil down." The Oiless is manufactured under the same strict supervision as applied to the Stark-Inland One Piece Piston Ring.

Coincident with the removal to new quarters, the company announced that it had absorbed the Shurnuff Manufacturing Company of St. Louis, and the stockholders of this latter company are now stockholders in the Stark-Inland Machine Works. With the addition of the Shurnuff line of products, which have been favorably known to the trade since 1916, the Stark-Inland organization now offers to the trader a varied line of products. The entire line, which is being marketed under the trade-mark brand of Star-K Products, is as follows:

Star-K-Inland Spiral Cut Piston Ring,
Star-K Oilesa. Quick-Seating Piston Ring,
Star-K Breather Spark Plug,
Star-K Shurnuff Grease Retainer.
Star-K-Shurnuff Combination Manifold,
Star-K-Shurnuff Running Board Supports,
Star-K-Shurnuff Wind Shield Ventilator,
Star-K-Shurnuff Heater.

In addition to the new facilities at Jefferson and Lucas Avenues, the company will continue to use the factory at Eighth and Mound Streets, where the equipment will be used to manufacture the tools with which the Piston Rings are made. Dies and jigs will also be made at this latter plant.

New York Coil Markets Generator Cutouts

The New York Coil Co., of 338 Pearl Street, New York City, have placed on the market a line of Generator cutouts consisting of two models. A special model for Ford cars only, fits on the round generator in exactly the position and by the same fastening means as heretofore employed. The second model termed "Universal" is adaptable to all cars using a cutout as the lugs are provided with two sets of differently spaced holes so that the Universal model will instantly fit on all Generator mountings or may be attached to the dash without boring holes or addition of any wires which is not the case with any other existing cutout.

This device is said to be made with instrument precision, is much smaller, more handsome in appearance and sets a new standard for generator cutouts. It is pointed out that irrespective of the efficiency of the Generator or how costly the storage battery may be the life of the battery is entirely dependent upon the faithful performance of the generator cutout. No effort has been spared to make this instrument as near trouble-proof as long experience and high grade workmanship can perform.

Full descriptive matter upon request to readers of this journal.

Piston Pin Manufacturer Issues Specification Chart

A manufacturer of piston pins and other automobile parts, has devised an aid to jobbers and dealers that has proved of great value to the trade. This is in the nature of a Specification Chart and describes the pins that can be furnished from stock or made to order.

The latest chart, dated January, which is now ready for distribution, contains a list of pins available for passenger cars, and trucks with Continental Motors. It also lists push rods manufactured for Overland cars and valve lift assemblies manufactured for Buicks. In addition, it contains particulars of manufacture, packing and shipping, and gives prices and credit rules and a list of branch offices maintaining a complete stock of pins. The stock list itemizes the manufacturer's stock number of pin, the car manufacturer's part number, make of car, year, model, make of motor, description of pin, size of pin and list price.

The specification chart thus tabulates all information regarding the product that might be needed by the jobber or dealer, and can be used in ordering a stock of piston pins.

This specification chart can be obtained on request from the Burgess-Norton Mfg. Company, of Geneva, Ill.

Evereadys Came in Handy

Three U. S. naval balloonists left their station at Rockaway Park, Long Island, on December 6, on a more or less routine test flight. Three days later they landed in the frozen wilds of Canada, without maps, without food, without proper clothing to withstand the intense cold, scores of miles north of civilization—lost in a mass of snow and ice—but famous!

The story of Lieutenants Kloor, Hinton and Farrell and their ill-fated joy ride is now history. But it is not so universally known that a small and comparatively insignificant Eveready flashlight was one of the things which contributed so much to the ultimate safety of these three flying men and helped to guide their failing footsteps to the Hudson Bay Company's post at Moose Factory.

"We left Rockaway equipped with two Eveready flashlights, two extra batteries and two extra bulbs. It is no exaggeration to say they proved a veritable godsend," says Lieutenant Kloor, the pilot. "Owing to the highly inflammable gases with which the bag is inflated, matches or open flames cannot be used in a balloon. For night flying the dials of all instruments are covered with a phosphorescent substance, but on our first night the fog and storm rendered this useless and we relied on our Eveready."

"When it became apparent during the night that we had lost our bearings, we tried flashing the blinker code, but owing to the extremely heavy fog we got no response. I have no doubt that on a clear night such messages flashed from a balloon could be easily picked up from the ground.

"In making our landing the extra batteries and bulbs were lost from the balloon, but we did manage to salvage one Eveready, and during those four days and nights as we struggled in the wilderness we found it invaluable. Searching for bits of dry wood at night or for any signs that might indicate a trail or habitation of any sort, we used our Eveready almost constantly."

The American Ever Ready Works of Long Island City, N. Y., has suggested to its dealers that whenever there are local accidents due to darkness and which Eveready might have prevented, advertising be built around the occurrence. One very simple way of doing this is to clip the story of the accident from the local paper, paste it on a card with a caption reading—"An Eveready might have prevented this." A window display built around this card is a sure attention getter and sales stimulator.

Tell Tale Piston Ring

The St. Louis Piston Ring Corp., 1823 So. 2nd Street, St. Louis, Mo., manufacture the Tell Tale Piston Ring, which is said to stop oil pumping and give high compression. The Tell Tale oil groove is also said to be non-clogging, because of the fact that it has outlets. This oil groove does not run into the joint and therefore the oil is not led right into the joint from where it would be forced to the top of the piston and spark plug.

This company publishes a folder called "Facts About Compression and Oil Leakage," which is very interesting and dealers and owners should write for copy.

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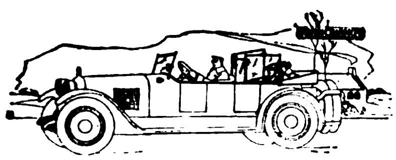
Gemco Town-o-Wings

The Gemco Manufacturing Company, Milwaukee, Wis., have placed on the market, a new device for rear seat wind protection called Town-o-Wings.

These wings are different entirely from any others that are marketed today. Instead of attaching to the rear of the front seat, they are fastened to the top rest on either side of the tonneau. They are so designed that a 12-inch Wing of plate glass can be adjusted to any position desired by the occupants. In this way complete protection from the discomforts usually found in driving is afforded, but nevertheless a conversation can be easily carried on between those in the front and those in the rear seat.

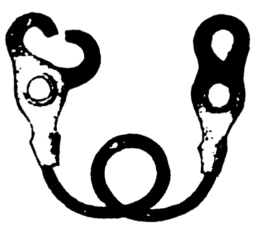
One of the biggest features of Town-o-Wings is the fact that they can be quickly and easily attached without changing or damaging the car in any way. This advantage makes them very popular with the dealers and jobbers as their profits are not eaten up by an excessive amount of time used in installing.

Town-o-Wings are made in four sizes and the Gemco Manufacturing Co. will be glad to make recommendations to any who are interested, upon receipt of the name of the car and the model.



Breaznell Clips

J. H. Breaznell, 26 Court Street, Brooklyn, N. Y., manufactures and sells Breaznell Clips for spark plugs and ter-



minals. These clips are said to lock like lock washers and it is claimed that vibration cannot loosen them. These terminals are suitable for primary and secondary wiring, and insure perfect connection.

It is claimed that they are permanently trouble proof, and can be applied and removed without taking out the thumb nut. These clips can be obtained in an assortment of two hundred, in show boxes six by nine inches, with descriptive circular on the inside of the cover which can be opened up.

Full information may be obtained by writing to the manufacturers.

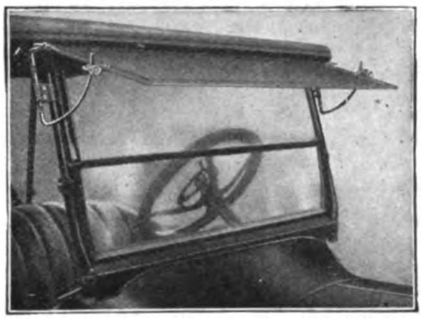
New Edition Auto Electrician's Guide

The Michigan State Auto School, Detroit, has issued a new Volume of their Auto Electrician's Guide, a compilation of automotive wiring diagrams. The "Guide" is complete in two Volumes, the two together containing over 1700 different wiring diagrams, ranging from 1906 to 1921. This is said to be a much larger number than any similar book issued to date has approached.

Presto Storm and Glare Visor

The "Presto" Storm and Glare Visor shown in the accompanying illustration, designed to shield the eyes of motorists from the glare of the sun, street lamps and headlights is one of the latest devices added to the wide line of articles manufactured by the Metal Specialties Mfg. Company, 338-356 N. Kedzie Ave., Chicago. It has been placed on distribution and already a heavy popular demand has been created for it.

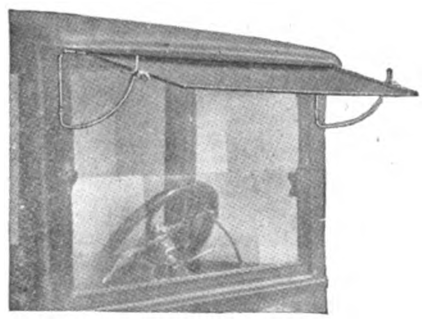
The Visor consists of a patented nickel-plated, adjustable bracket and has a thumbscrew attachment which permits



its adjustment to any range or angle of vision without the driver leaving his car. When used on an ordinary touring car the supporting brackets are held in position by two steel clamps which fasten to the windshield posts. Each bracket is provided with screw holes so that when applied to closed cars the clamps are not used and the bracket is screwed securely to the frame of the windshield.

A special bracket is made for Ford touring cars and roadsters.

The frame, the joints of which are electrically welded, is covered with black water-proof auto top material firmly stitched and presents a neat and finished appearance. A wide piece of material is left at the back of the Visor in order to completely seal the space between the auto top and the visor, thus excluding rain or snow. A round piece of bar steel extends across the top on the entire width of the windshield, projecting two and one-quarter inches on each side. The adjustable brackets slide on this



bar so that each visor is adjustable in width to suit any car within a variation of four inches.

The Preston Visor is being made in two sizes, the larger one being four inches wider than the smaller and with this adjustable feature will fit all cars from 36 to 44 inches in windshield width measuring from center to center of the windshield posts.

It is claimed for the device that it adds greatly to the comfort and safety of motoring, relieving the constant eyestrain and preventing accidents due to clouded windshields and glaring light.

The Petry Tire Pump

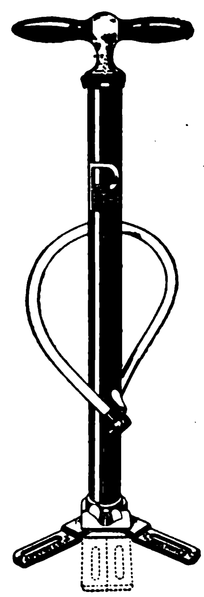
The new Petry Tire Pump has just been placed on the market by the N. A. Petry Co., Inc., Philadelphia.

The Petry Pump is said to be radically different from any other hand tire pump. It is designed to pump easier and to fill the tire quicker than any other pump, and its graceful lines and high finish give it a neat, stylish appearance, which will appeal to the motorist and trade alike.

Of the five distinct features—the spreading foot base has aroused the most interest. This improvement over the ordinary base now in vogue places the pump sufficiently away from the motorist to allow a *natural* pumping position. A full long stroke is possible without touching the body.

Equally important is the exclusive Petry valve. It is not merely "commercially" air tight—but is guaranteed to be *absolutely* air tight. This valve must resist a factory test of an air pressure of 100 pounds under water—it has withstood a pressure of 150 pounds per inch.

The handle "feels right" when the motorist pumps, because many tests were made to develope a shape that would fit the hand. The Petry handle does its



part to make pumping easier—ample thumb room and a round firm grip.

A Handle Lock is the fourth feature. With the lock snapped in place the handle tee and plunger are rigidly held—so that the pump may be readily removed from car.

The Piston is convex shaped to divert the lubricating oil to the sides of barrel for ease of lubrication and greater pressure on the leather cup washer.

The Lox-On Connection at end of hose with Tire Valve Deflating Pin also lessens pumping effort and can be used only on a pump having an absolutely tight check valve. The Deflating Pin keeps the tire valve open and saves the pumper the effort necessary to unseat the tire valve with such stroke (usually a 20 lb. pressure required).

The hose is 27 inches long and 5 ply highest grade rubber tubing, securely fastened at each end by a specially designed clamp that will hold the hose tight. The finish is baked black enamel with high lustre. All brass parts are polished and lacquered.

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Mr. Haywood's Work

Twelve years ago Miner Haywood, founder and president of the Haywood Tire & Equipment Co., kicked off his jumpers, washed up and quit his job as an automobile repairman.

The next day he started in business for himself backed by $1000, lots of determination—and faith in the future. He chose tire repairing as the most promising field of endeavor in the automobile industry. That he made a wise choice is proven by the present magnitude of the Haywood plant in Indianapolis, and by its still greater development in size and scope.

From the first tiny, meagerly equipped repair shop has sprung a big, modern, fully equipped manufacturing plant covering two acres of ground and comprising over 20,000 feet of floor space. A modern school with an alumni of over 8000 all its phases from motorcycle tires to men who have learned tire repairing in massive truck pneumatics! A foundry covering two acres of ground and capable of producing a wide range of castings in size and weight.

A completely equipped branch school in Akron, O., which is the forerunner of several similar schools to be established in every part of the United States.

Also, from an original investment of one thousand hard earned dollars has accrued holdings valued well over $400,000.00!

In twelve short years—despite fierce and aggressive competition—in face of almost insurmountable difficulties—Miner Haywood has succeeded in making the name "Haywood" synonymous for all that is new, modern and dependable in tire repair machinery.

For early in his career as a repairman, Mr. Haywood realized an acute need for improved repair machinery and better repair methods. Working along inventive lines, he built vulcanizing machines; tried them thoroughly; proved their utility and success beyond a doubt, then disposed of his repair shop and boldly launched into the manufacturing field.

His next progressive step was the establishment of a school in which men could quickly learn the rudiments of tire repairing and how to manage repair shops. In this school the Haywood Tire Surgery system is taught. The course is so systematically arranged that a man can ordinarily acquire a splendid knowledge of the simplified methods within two weeks. The sphere of instruction is so wide that even repair methods best suited for heavy pneumatic truck tires are taught.

Mr. Haywood has surrounded himself with a splendid corps of co-workers. This well balanced group of executives is backed by a small army of skilled workmen who build lasting quality into all Haywood products, which in turn are placed in the hands of Haywood trained men, all of which has established and maintained the prestige now enjoyed throughout the world by the House of Haywood, and has done its part in developing a little $1000 business into the present $400,000.00 institution.

Sprague Worm Steering Gears

The Sprague Tire & Rubber Co., 18th & Cuming Sts., Omaha, Nebraska, have recently placed on the market their new model "M" Sprague Worm Steering Gear for Ford cars.

Ford owners very often find that if they strike a stone, or some other obstruction their machine turns or swerves to one side. Very often in their haste to straighten the car, they pull and tug at the wheel until with a snap it locks over center, leaving them helpless or in danger of turning turtle and driving into trees or fences.

It is claimed that when the Sprague Worm Steering Gear is attached, it is impossible for this to happen, because the car will ride over obstructions in the road rather than swerve to one side. It is said that with this device one has entire control of the wheel at all times.

With the many campaigns for safety and safe and sane driving, car owners should equip their cars with a device which prevents accidents. To that end it would undoubtedly pay them to investigate the device described above.

The Daddy Vaporizer

Many car owners are considering the question of buying a vaporizer for their car. Perhaps they have difficulties in starting their car in this cold weather, and are anxious to employ some method whereby starting will be made a simple matter.

They will do well to investigate the Daddy Vaporizer, manufactured by the Daddy Vaporizer Co., 1317 Maumee Ave., Ft Wayne, Indiana. This vaporizer is said to make starting easy, to withstand heat, water or acid, to keep the spark plugs from oiling up, and to vaporize the gasoline when hot. These vaporizers are made for various cars, each car having its own special model, according to the passageway in the cylinder block.

The Daddy can be obtained to be used successfully on the following 1920 models: Ford, Nash, Dodge, Essex, Paige, Pilet, Hudson, Oakland, Mitchell, Hupmobile Overland 4, Studebaker 4, Studebaker 6, Chevrolet Baby Grand, and Willys-Knight. These vaporizers are easy to install, it being necessary only to remove the intake manifold from the cylinder block, insert the vaporizer, put back the manifold and the installation is complete.

New Firestone Product

Much scientific and technical interest is being centered in the Cross and Square tread tire developed recently by engineers of the Firestone Tire & Rubber Co. of Akron, O. The tread is somewhat of a departure from all the old ideas in tread designing. It was in the process of development many months before actual production was begun in the Firestone factory.

The Cross and Square is said to be a highly developed combination of all the advantages contained in the former tread types, its creators declare. It is said that all the minor disadvantages encountered in tire building have been practically overcome in its building.

The basic idea behind the whole design is the elimination of localized tension at any point on the tire, according to the engineers who perfected it. A plain square stud design permits the running of "breaks" straight across the tire, thereby causing a tendency for the tire to bend at this point. The resulting hinging action in the breaker and fabric under this weak spot causes separation and breaking down of the tire.

The Cross and Square tread is zigzagged in such a manner that recesses cannot run for any considerable distance in one direction. At the same time the numerous different angles offer greater traction resistance and anti-skid effect.

It is claimed for the new design that beside the equal distribution of action over the tire and the balance of pressure the extra rubber required in the finishing of the design affords greater traction power, especially on slippery pavements or muddy roads.

Special features are being added to the design for use in the construction of truck tires, it is said.

The Franzen Adjustable Striking Plate

A device which is said to be a positive and adjustable anti-rattler for automobile doors is manufactured by Franklin Williams, Inc., 256 Jefferson St., Newark, N. J. and called the Frazen Adjustable Striking Plate. It is designed to replace the old style striking plate or catch used on automobile doors.

This plate is made in several styles for various type doors. It is claimed that with this device the defects of the old style catch are eliminated. It is very easily adjusted and at all times insures a perfect and noiseless fit to the doors. It should be of particular interest to those people who have been annoyed by the constant rattling and vibration of the doors of their car.

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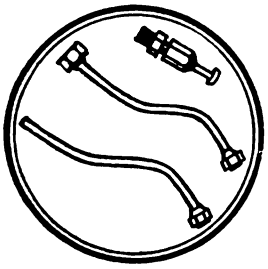
Prest-O-Torch Style D

Prest-O-Torch Style C

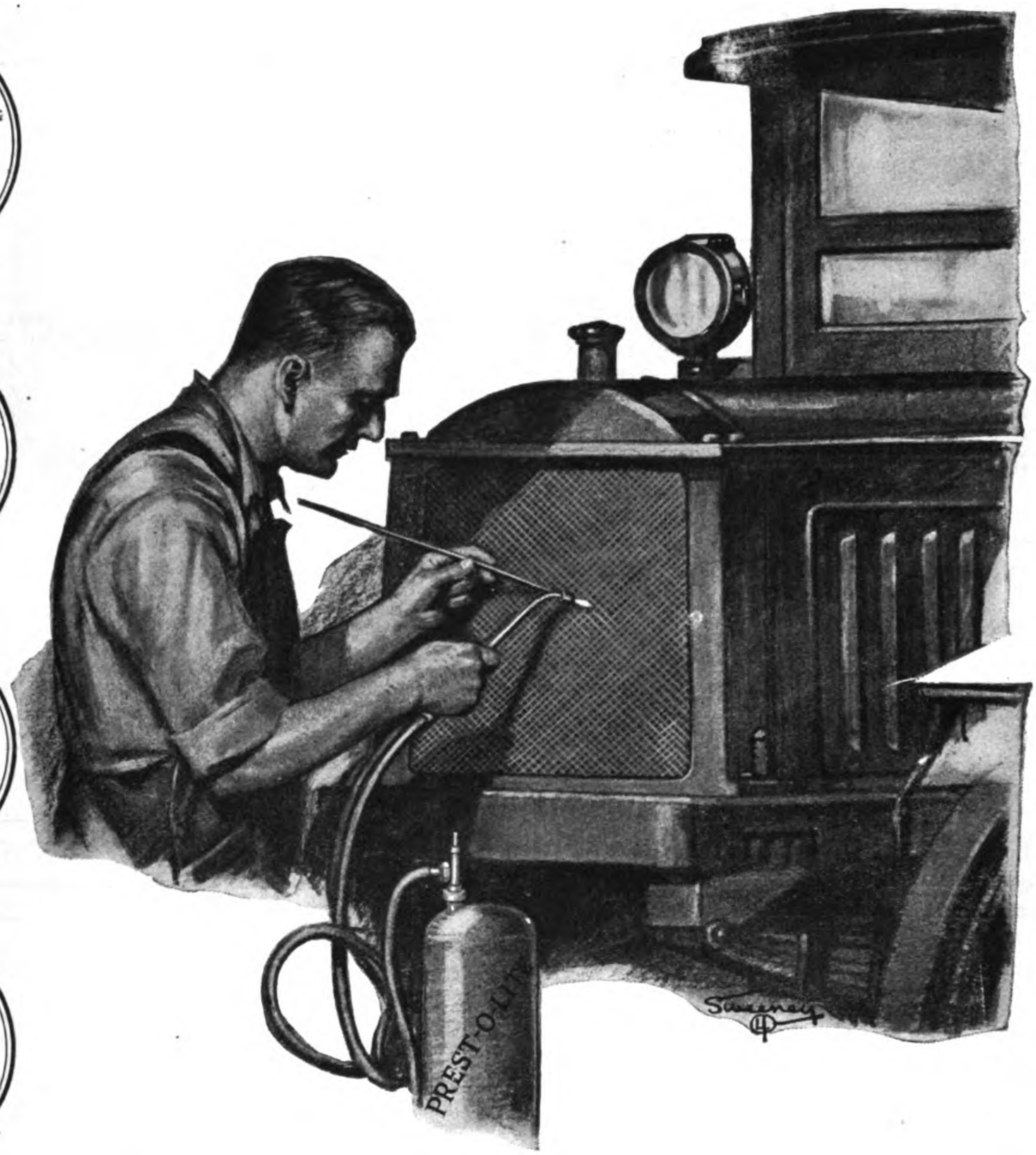
The Prest-O-Lite Paint Burner

The Prest-O-Lite Soldering Iron



Prest-O-Torch Style A

The Prest-O-Lite Gas Tank 6 x 20 inches, sturdy and portable



The double duty gas you sell

MORE than likely you are one of the more than twenty-two thousand garage and shop owners who stock Prest-O-Lite Gas in order to supply the great and ever-growing demand for this best of truck-lighting agents.

Do you realize that the same handy little tank of Prest-O-Lite Gas you sell to truck owners will supply you with concentrated heat for soldering, brazing, melting, annealing, bending and other every-day jobs?

The makers of Prest-O-Lite Gas also make a complete line of appliances for use with Prest-O-Lite Acetylene and air, such as torches, paint burners, soldering irons and the like.

Whether you wish to mend a radiator, melt, braze or solder there's a Prest-O-Torch designed to do the job to the best advantage.

Prest-O-Lite Gas is a clean, economical and highly convenient fuel for these purposes and, is on tap when and *only* when you want it.

Write for further information concerning Prest-O-Torches and their usefulness to you.

THE PREST-O-LITE COMPANY, Inc.

Small Tank Sales Department

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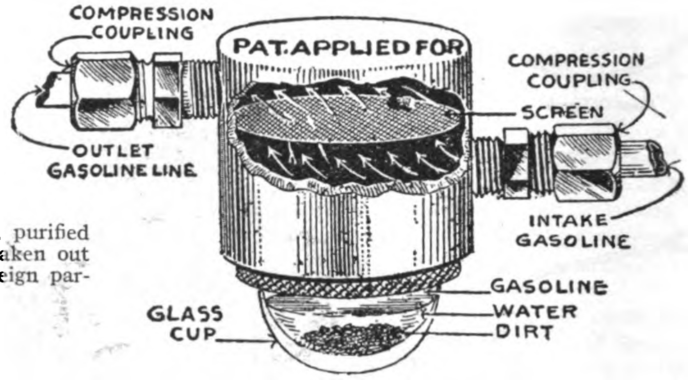
HOW MUCH IS YOUR PEACE OF MIND WORTH?

IS IT WORTH $3.50?

THE WETHERHOLT VISIBLE GASOLINE PURIFIER



goes right ahead supplying your engine with a clear, clean, purified gasoline. All guess work is eliminated—all the mystery is taken out of the gasoline—no more dirt, rubber, lint, rust, water or foreign particles can possibly get past this watchman.

The gasoline of today *must* be purified if you expect your engine to have the proper "pep". Don't forget the price is only $3.50.

NO THREADING OR SOLDERING

It can be attached in a jiffy by anyone, any place in the gasoline line, where it is most convenient to set the glass bowl, which should be emptied when necessary.

WEIGHT FOUR OUNCES

The *Purifier* is a handsome device made of Aluminum, Brass and Glass, and will outlast any car.

REMEMBER: This *Purifier* is no way connected with any of the old style make-shift purifiers—it is a brand new absolutely scientific system.

You get our iron-clad air-tight guarantee that if within 30 days you cannot say it is the very best purifier you ever had—we return your money. Put one on your car.

DEALERS: Write for Exceptionally Good Proposition.

MANUFACTURED BY

AUTOMOTIVE MFG. CORP., STRAUSS BLDG., CHICAGO.

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NEW TYPE OF RADIATOR
***for* FORD CARS**
AT NEW PRICES!

A Honeycomb Radiator; inner unit made entirely of brass. Note improved water passage construction in cross-section. A radiator that sells on sight with a good profitable margin. Cooling efficiency guaranteed and will give service without interruption.

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SECURITY DISPLAY TIRE RACK

Will open or close with one operation The lever arm contains a Yale spring lock which secures it to the frame.

Arc Electric Signal. Aluminum arrows encasing 20 candle power nitrogen bulbs and faced with Ruby glass. Effective day and night. Write.

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DUNTLEY TIMERS
—— For Ford Cars ——
DUNTLEY Magneto Break TIMER
For All Purposes
DUNTLEY Four Unit TIMER
Especially designed for Commercial Cars.
Write us today for full details.
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PROFIT PRODUCERS FOR FORD CARS
Precision Top Converter
Krom-Nik Anderson Special Ratio Gears
F. & H. Roller Bearings.
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"BABY" Hammerless Revolvers
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Pacific Coast Representatives: McDonald & Linforth
San Francisco, Cal.

Service to the advertiser is often visualizing for him the possibilities of his own business.

Book on High-Speed Hoist

So insistent has been the demand on the part of Garages and Automobile shops throughout the country for more and specific information pertaining to the High-Speed Hoist, that the Wright Manufacturing Company, Lisbon, Ohio, has prepared a special book on this particular use of their product. It is just off the press and a copy will be gladly forwarded to the readers of this paper on request.

Staynew Self-Cleaning Air Filter

Patents have just been issued by the United States Patent Office on the Staynew Self-Cleaning Air Filter for automobiles, trucks, tractors and air compressors. Manufacturers and motor vehicle owners have recognized the damage done to motors by road dust, sand and grit entering the motor through the air intake to the carburetor and have emphasized the need for an air filter which would completely filter this dust, sand and grit from the air and at the same time require little attention.

The Staynew filter is said to solve this problem entirely. It is manufactured by the Staynew Filter Company, Rochester, N. Y., and has been tested out thoroughly. Full information relative to this device, which is said to "take from the air the cause of wear," may be obtained from the manufacturers. They publish an interesting folder which describes in full the construction and operation of their product.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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AUTO TIMER REFINISHING TOOL

By George McVicker

WHEN the inner surface of a timer becomes worn, the contact roller or brush will frequently strike a high place on the surface and be thrown over the contact point, thus causing a mis-firing of the motor. To remedy this the rough worn surface must be made smooth. I have made a simple tool with which to do this, that is made as follows: A piece of one-half inch round rod is squared at one end for fitting brace, puss drill or lathe chuck. Then about two inches from the

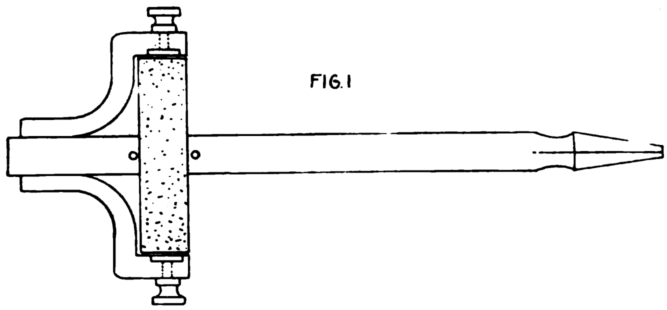


FIG. 1

other end two three-sixteenth holes three-quarters of an inch apart are drilled. A steeple made of three-sixteenths of an inch wire with square outer corners is inserted in these holes and a piece of heavy spring such as clock spring or phonograph spring is looped over the outer end of the steeple and riveted to itself. The spring should be equal to the circumference of the timer inner surface, after a loop is formed on the

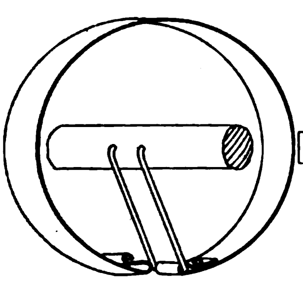


FIG 2

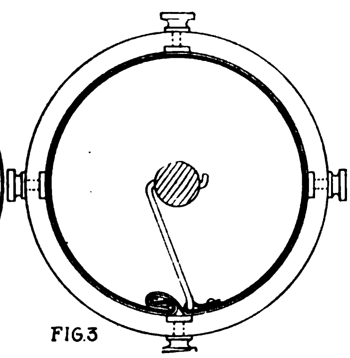
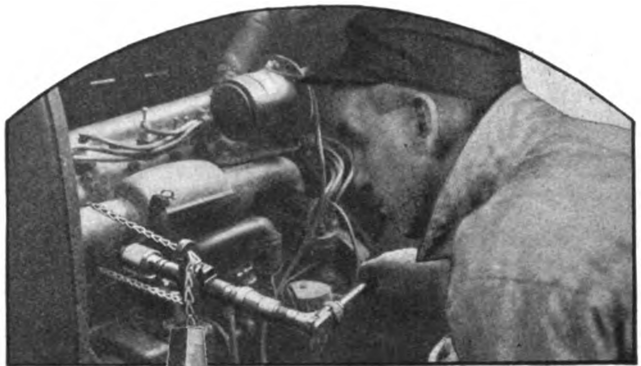


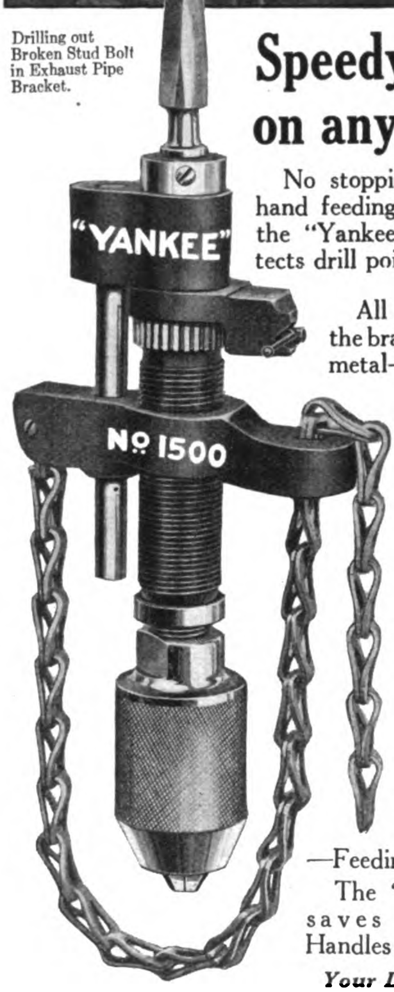
FIG. 3

outer end for holding a piece of emery cloth. To operate this tool a strip of emery cloth is cut and inserted in the tight fitting looped hook at the end of the spring, then wound around the outer surface of the spring and both placed in the timer. The tension should be such so as to hold snugly to the surface of the timer and as the shank with the spring and emery cloth is revolved and the timer held stationary, the surface will be quickly smoothed and trued up.

(Editor's Note: The above article was printed in the January issue of the magazine without these cuts. Several readers have written in suggesting that the description would be clearer if illustrated, and to that end we have had drawings made to accompany it. We are therefore reprinting the article.)



Drilling out Broken Stud Bolt in Exhaust Pipe Bracket.



Speedy and Sure on any Job

No stopping every few turns for hand feeding! No slowing down—the "Yankee" Automatic Feed protects drill points.

All you have to do is turn the brace. Bit cuts straight into metal—rapidly—continuously.

"YANKEE" CHAIN DRILL

With the Automatic Friction and Ratchet Feed

Friction Feed quickly runs drill down to work. A touch of the shift lever throws the Ratchet Feed into play—and the drill moves steadily through the cut.

—Feeding is automatic!

The "Yankee" Chain Drill saves time and drill points. Handles drills up to 1/2".

Your Dealer Can Supply You

No. 1500. 3-jaw chuck for round-shank drills up to 1/2 in. Length 9 3/4 in. Weight 3 1/4 lbs.
No. 500. 2-jaw chuck for square-shank drills up to 1/2 in. Length 10 3/4 in. Weight 3 1/2 lbs.

Write for free "Yankee" Tool Book. It should be in the hands of every man interested in tools. Illustrates in action all the ingenious "Yankee" Tools for drilling, boring, tapping and driving screws.

NORTH BROS. MFG. CO.
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"YANKEE" TOOLS
Make Better Mechanics

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You cannot estimate the possibilities of tomorrow by the viewpoint of yesterday.

If there is a time for cutting down advertising space--there is also a time for ordering larger space—and that time is

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"Famous for producing tangible results."

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Contents

IN THIS ISSUE

BEARING ON BEARINGS

SOMETIMES the greatest ideas owe their being to the most trivial things. Take that little affair of old Benjamin Franklin and the kite flirting with lightning. While Ben was recovering from the shock he probably dreamed of our modern wireless and saw the whole world being operated with electricity. Or consider the time when Isaac Newton lazily went to sleep under a tree of ripe apples. Hardly did he awake from his slumber when he was knocked to sleep again by the impact of a rosy fruit against his dome. In his second sleep he worked out the law of gravitation and had it not been for Sir Isaac we would probably be buying our sugar by the gross and our flour by the dozen to-day. We might be plodding along without knowing anything about gravitation and there would be hundreds of airplanes stalled in the clouds waiting for relief expeditions.

Just such an accident gave our Editor his big idea for the story for next month; an article on bearings. He was reading an article on converse statements, statements which can be read either forward or backward and mean the same thing. The words "bearing on repairs on bearings" simply popped into his head. Probably in years to come this article, for our next issue, will be quoted by our various authorities and will form a part of classic study in our schools. The same article will be by way of being the third chapter of "Spring Cleaning" as well, and anyone can see that we are killing two birds with one rock, by combining the two ideas.

Some wit has remarked that a man is as old as his rheumatism and if this be true, then a car is as old as its bearings. Another way of saying that the car lasts only as long as its bearings.

The article will not only discuss the repairs to be made on various bearings but will take up briefly, bearing adjustments and general care as well as the question of lubrication.

Some bearings require certain kinds of lubricants which might damage other types; some kinds of bearings must be adjusted differently from others, or they will destroy themselves and then there comes the matter of fitting which is a story in itself. Yes, there is plenty to learn about bearings!

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APR 29 1921

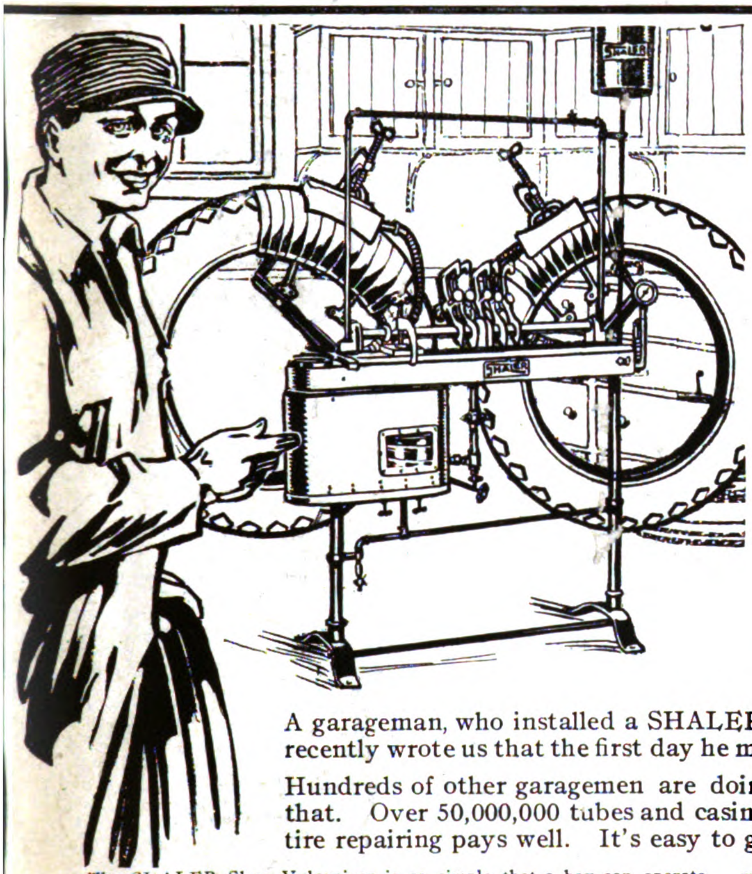
Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 71-73 Murray Street-New York City

Entered as Second Class matter January 15, 1921 at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

Vol. 31. No. 2 APRIL, 1921 Monthly $1.50 per Year Single Copy 15 Cents



How He Makes $50 a Day In a Corner of His Garage

A garageman, who installed a SHALER Vulcanizing Plant in a vacant corner of his garage, recently wrote us that the first day he made $45 and that his profits often ran over $50 a day.

Hundreds of other garagemen are doing just as well, and many make much more than that. Over 50,000,000 tubes and casings need repairs. There is plenty of work to do, and tire repairing pays well. It's easy to get all the work that you can do.

The SHALER Shop Vulcanizer is so simple that a boy can operate it. You don't need experienced help, because it has Automatic Heat Control, and cannot overcure or undercure the rubber. You don't need to watch or regulate it.

With the SHALER you can make any kind of a casing repair that is practicable to make—and it has a very large capacity. Repairs 12 casings and 200 tubes a day, and does perfect work. It only requires about as much room as a bicycle—and is portable—but does just as much work as the big cumbersome vulcanizing plants which take much more room, cost several times as much and require an experienced operator.

The SHALER uses the "Wrapped-Tread" Method—which is used by tire manufacturers—and turns out better jobs in less time than any other method.

The complete SHALER Vulcanizing Plant—equipped with gas or gasoline burners for steam heat—or for electricity—including all necessary tools and complete instructions, costs less than $100.

Write for Free Book—"How to Open a Tire Repair Shop"

which give many helpful suggestions and simple instructions for making tire repairs. Don't fail to write for this book today. It will show you how to make more money and establish a profitable tire repair business. Do you know of any other business which pays so well that can be started for less than $100?

We manufacture a complete line of SHALER Vulcanizers for every requirement of Garages, Repair Shops and Service Stations. They are used by the U. S. Government—and sold by reliable Jobbers all over the world. Write for our catalog which describes the complete SHALER Line, of steam, electric and dry fuel vulcanizers.

C. A. SHALER CO., 803 Fourth Street, Waupun, Wisconsin

Oldest and Largest Manufacturers of Vulcanizers in the World

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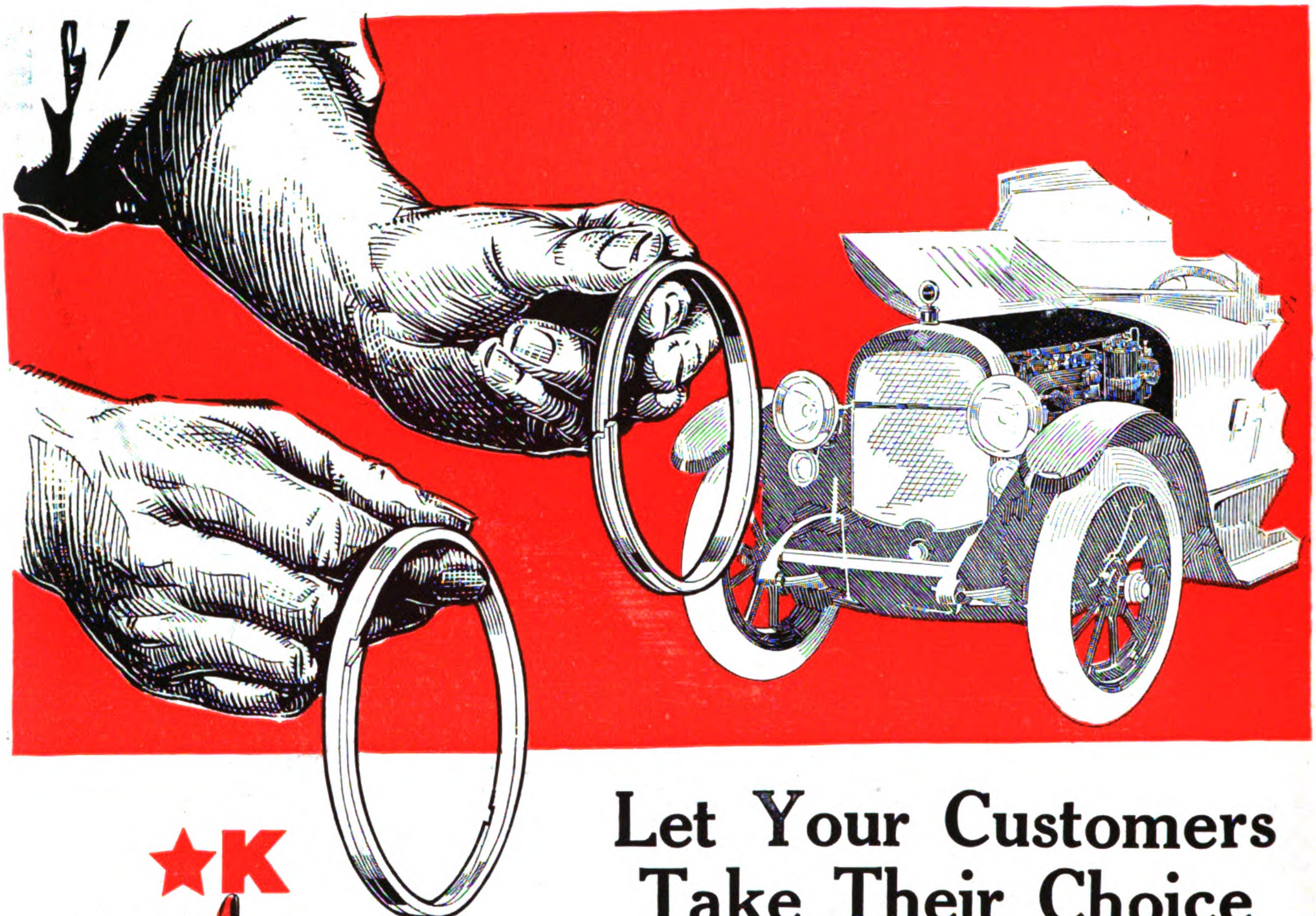
Buyers' Guide and Index to Advertisements, Pages 96 and 97 Table of Contents will be found on Page 98



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Let Your Customers Take Their Choice

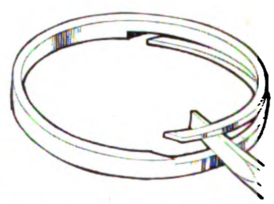
Here are two wonderful piston rings -- the Star-K Inland and the Star-K Oiless.

With these two rings you can satisfy any kind of car owner and make a good profit for yourself.

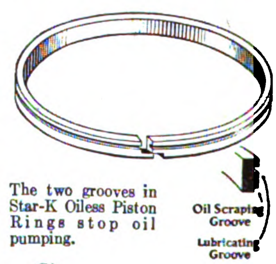
THE STAR-K INLAND has a well established reputation for exceptional efficiency and long service. Specially heat treated after being spirally cut causes the ring to uncoil like a spring against the cylinder walls, with equal tension all around. They "follow the wear," thereby postponing replacement. The spiral cut also gives great flexibility, the overlapping ends quickly accommodating themselves to any slight unevenness in the cylinders.

STAR-K OILESS PISTON RINGS have four outstanding features: 1st, popular price—50 cents up. 2nd, two oil grooves—one in the middle for lubrication and one on the lower shoulder to scrape down excess oil. 3rd, the velvet finish of the contact surface that causes them to "seat" quickly, producing maximum efficiency in minimum time. 4th, the special heat treatment that results in equal expansion in all directions, insuring maximum compression.

STAR-K INLAND and **STAR-K OILESS PISTON RINGS** fit the grooves without filing, because every ring must pass a micrometer test that allows a variance in the width of not more than ½ of one thousandth of an inch.



The "spiral cut" of Star-K Inland Piston Rings is an exclusive feature that enables them to follow the wear.



The two grooves in Star-K Oiless Piston Rings stop oil pumping.

OTHER STAR-K PRODUCTS

Star-K "Breather" Spark Plugs.
Price, $1.50 each.

Shurnuff Junior Spark Plugs.
Price, $.90 each.

Star-K Shurnuff Grease Retainer for Ford Cars.
Price, $.90 each.

Star-K Shurnuff Ventilating Windshield for Ford Cars.
Price, $7.50 each.

Star-K Shurnuff Combination Manifold for Ford Cars.
Price, $9.00 each.

The Star-K Shurnuff Running Board Supports for Ford Cars.
Price, $3.90 per pair.

For further particulars, write us

STAR-K INLAND

ONE-PIECE PISTON RINGS

STARK-INLAND MACHINE WORKS, St. Louis, Mo.

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VOL. XXXI, No. 2 APRIL, 1921 PRICE { 15c per Copy $1.50 per Year }

WASHDAY AT THE O'REILEYS

Compiled by the Editor

Comics and Ornaments by Jatt

MONDAY, in the life of the O'Reilley family, is always a blue affair; bluer than the sky after a storm; more troubled than the ocean after a hurricane and as full of work as a Federal Income tax office on March fifteenth. In plain English, Monday is washday in the life of the O'Reilleys.

At approximately four o'clock on Monday morning the O'Reilley alarm clock sounds its strident note and O'Reilley senior stops snoring and begins to kick. Wails from the youngest O'Reilley, yowls from the next youngest and miscellaneous grunts from the various other descendants announce the breaking of another day. Before the end of this day other things than the day itself will break. The O'Reilley family, as a unit, arise, for they know it is washday, and "blue Monday" is no day for dallying.

The business of breakfast finished, and let me tell you it is a business to be quickly finished on washday, the various units of the family go about their manifold tasks. Mr. O'Reilley draws the water in the big boilers and shortly the kitchen is white with steam. The water having asserted itself, a portion of it is used for cleansing the various faces of the family group.

Mrs. O'Reilley dumps the Wilkens' wash into one boiler, the Robbins' wash into another and the battle is on. One of the older girls, assisted by the lady of the house, scrubs the clothes, one of the boys twirls the wringer and by the time school begins, the back-yard is a waving mass of shirts, socks and other clothes. Mr. O'Reilley hies himself off to his work in the nearby garage where he washes an accumulation of Sunday mud from the cars of his patrons.

The day wears on, and a wearing one it is for the O'Reilleys. A cold lunch served in a hot, steam-filled kitchen separates the morning from the afternoon and the Wilkens'-Robbins' washes from those of Brown's-Harrison's. The wash for the O'Reilleys themselves rounds out the day and when Mr. O'Reilley returns at six o'clock, for nourishment, the last of the sundry washes has been gathered to the fold.

One by one the family passes through the tubs, starting with the youngest and ending with Mr. O'Reilley himself until finally the well-worn wash-water has done its bit and starts on its way toward the sea. Washday closes with the moment when Mr. O'Reilley stops kicking and starts to snore.

The O'Reilley family are a family of washers,—you can see it in their faces from the youngest shiny, pug nose to the be-whiskered visage of O'Reilley, the elder, and having followed this calling, which amounts almost to a profession with the family, few there are who can show any of them anything about washing.

Mrs. O'Reilley knows as much about the practical application of hot soap-suds, potash lye, washing soda, kerosene and blueing as the professor of chemistry at the village high school. You don't catch her rinsing out the clothes in ice water because, to use her expression, "Ye'd have the divil's own time a' gittin' out the grase onct 'tis set."

And it's the same way with O'Reilley the elder; perforce he knows much about clothes washing, but he knows more about washing cars because that happens to be his job. Since few or none of us are often called upon to wash clothes we are not quite as interested in the trials of Mrs. O'Reilley as her amiable husband and so we will follow Mr. O'Reilley about his daily tasks, watch him as he washes the cars and listen to what he may have to offer in the way of advice.

To save time we will walk to work with O'Reilley and hear what he has to say regarding automobiles

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and finish and water and so on. We cannot re-produce O'Reilley's dialect and so will not even try but will put his talk into ordinary, every-day American.

"Yes" says O'Reilley, but with a brogue, "Autos and clothes are much alike in many respects when you come to wash them. You can look upon a Ford car as like a pair of over-alls, it'll stand a lot of dirt and water and strong soap without really being spoiled for looks, but the bright newness will wear off after a time and you expect it to. But the finish on a really good car, like a Marmon or a Cadillac or a Pierce is somewhat like one of those thin silk things the lady wears, and calls them 'waists.' And when you wash them things (either the cars or the waists), you have to be mighty careful or they'll never look the same again.

Don't Use Cold Water

"The first thing to look out for is the use of cold water and the second, hard water. Ice cold water will harden grease and oil and give it a surface which you can't get off unless you take a chance of removing the varnish and even the paint with it. Cold water on a warm car will often crack the varnish. And the same thing happens when you put hot water on a cold car.

"Hard water doesn't do any particular damage but it leaves a scum of lime on the surface and also hardens the grease. Perhaps you have often seen a new car, with varnish in perfect condition, but dull and without any gloss? It's the hard water that has done the trick and it will take a lot of polishing before the finish will shine again."

By this time we have arrived at the garage and while O'Reilley is getting into his rubber boots we will look over the washing equipment. O'Reilley sends us up to the top floor and suggests that we go out onto the roof of the garage as well to see what we can see. We find a big flat tank in one corner of the top floor, near to the steam pipes and likewise a tank on the roof. Both tanks are connected with the public water system through a float valve and also with the hose at the automobile wash stand. All of the water which runs through the hose must first run into one of these two tanks.

When we come down to the wash stand again O'Reilley tells us about the tanks. "In the Summer," says O'Reilley, "we use the tank on the roof and all of the water that goes onto the cars passes through the tank on the roof and the tank holds about enough water for three cars. Considering the time it takes to change from one car to another and the time I'm busy on odd jobs, the water has a chance to warm to about the temperature of the air and is never as cold as that from the public water system.

" 'Tis the same way with the water in the winter time. Then we turn off the water from the roof tank and use the water from the tank on the top floor. We thought, at first, that it would be a good idea to run a steam coil right into the tank but later we found that this was unnecessary because the water remained fairly warm even on the coldest days. And then again, we don't wash as many cars in the winter anyway."

After this short lecture about tanks and water O'Reilley pushes over the first car to the wash stand. The car looks as though it might be an automobile if it didn't have quite so much mud on it. O'Reilley turns the hose on just enough to get a stream of water from it and sets to work. He starts at the top of the car and flushes off the dirt, that is as much of the dirt as will run off with the water. He gradually works downward until all of the loose mud and dirt has been driven off. He doesn't try to scrub off the dirt or scrape it, because as he says, he just wants to see what he is going to work upon before he starts.

He asks us to feel of the water and see how warm it is and sure enough, it is warm enough to take a comfortable bath in. When asked what he would do it he wanted to wash a car at home and didn't have warm water to start with, O'Reilly says that he would warm about four pails full of water to about 80 degrees and go over the car with a soft sponge wet in this water before doing anything else. "Never start with water straight from the tap" says O'Reilly.

Then he turns the water on a little harder and goes over the whole car again from top to bottom, "just for luck" he says, "and to drive off more of the dirt which has been softened by the water first used." Still another part turn of the tap and with a strong stream of water O'Reilley flushes off the running gear.

Use a Gentle Stream

"You can use a fairly strong stream of water for washing off the running gear" says O'Reilley, "without damaging the paint surface. Have you ever seen a sand blast machine at work? Well the thing drives little hunks of sand against metal parts which are being cleaned. It beats a file or sand-paper all to pieces and gives the part a pretty slick cleaning, but it sure does a pile of scratching. A strong stream from the hose, beating against the dirt on the car, drives the dirt against and into the finish and spoils it, but the paint and varnish under the running gear is not so fine and is much harder than that on the body and so you can wash the running gear with a stronger stream of water than you would use on the open parts of the body."

"You'll notice," says O'Reilley, "that I'm always careful, while I'm washing around the hood and radiator, not to drive the water into the engine. If I see that the hood doesn't fit against the cowl or the radiator I wash around it. You have to watch out when your washing a Ford car or you'll get the whole darned ignition system so wet that it'll take a week of Sundays before the car will run on all four cylinders."

Having said this O'Reilley opened the hood and wiped off all of the surplus water he could find on the engine. Then he took the hose and placed it against

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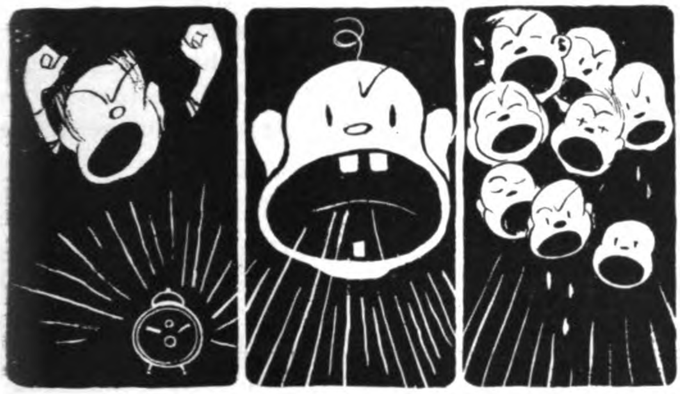
the surface of the radiator on the inside so that a stream of water was forced through that unit.

"You'd be surprised at the amount of dirt there is in a radiator," he said. "When a man brings his car into the garage and says that the engine is running too



"The Breaking of Another Day as it is Announced at the O'Reilley Managé"

hot, they always turn it over to me the first thing. I always give the radiator a good bath, from the inside, mind, never from the outside, and in nine cases out of ten the engine will run cool until the radiator gets dirty again.

"People seem to think that, if a radiator is clean inside, it is all right. But if the outside is caked with mud, then the air cannot circulate through it and it overheats."

By this time O'Reilley has flushed off practically all of the dirt. There are a few places where the mud is still caked on and he goes over these places again with the stream of water which he has turned almost off. He takes a few minutes to examine the spots still left and explains that he is looking for grease spots and mud which is caked on with grease and oil. The latter he leaves for the time being and returns to the caked dirt which he moistens again and again until it runs away with the water.

Only the Best of Soap

He then mixes up a pail of warm water and soap shavings until there is a thick lather. "I use only the best grade of soap, soap that doesn't have any chemical action on the finish" he says. "It never pays to use washing soda or potash or strong chemicals because these things always remove some or all of the finish."

With this soap mixture he washes the dull portions of the car, the places where there seems to be grease or oil present. He doesn't touch the soap to any of the clean parts because, as he says, it's only a waste of time and soap. "When a car is clean, it's clean and soap won't make it any cleaner:" Good logic, we must admit.

Warm water and soap will remove all of the dirt and grease, except road tar. Asked what he does with spots of road tar, O'Reilley says that he depends upon a manufactured product for this purpose. "I took a chance the first time," he says, "with some of the stuff called 'tar remover' and it seemed to do the work without destroying the finish, so I use it now. One chance was enough and so long as I know that stuff will do the work, without damage, I don't need to take a chance with any other."

A final flushing all over with the hose and the car is ready to be dried which O'Reilley does with a clean, soft chamois. He keeps a chamois skin for the body and another for the running gear. He also keeps the sponges which he uses on the body and those on the running gear separate.

A final polish with a soft flannel cloth and the car does credit to the "Son of Erin" and O'Reilley calls it done.

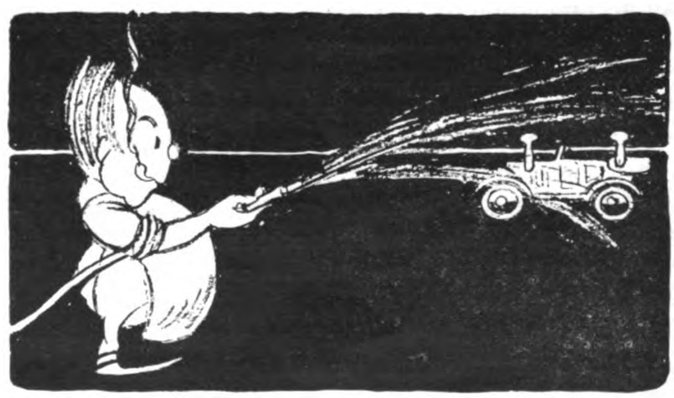
"Now before you leave," says O'Reilley, "let me tell you something else which you can pass along for what it is worth. Sometime we garagemen are going to wake up and charge our patrons for washing cars and make that charge on a sliding scale. For washing a car twice in a lifetime we'll charge half the price of the car, and we'll earn our money. For washing it twice a year, five dollars each time. Twice a month half that figure; once a week, one dollar each time.

Wash the Car Often

"I'd much rather wash a car once a week at half price than twice a month at double the figure because it is four times the work. It isn't the amount of dirt that counts anyway, it's the time the dirt is on the car and the way it is caked on that counts. I've had cars come into this shop that were covered with mud from radiator to tail light and have them washed clean inside of twenty minutes. I've had others come in with nothin' but a few cakes of hard mud on them and spend a good hour trying to get the dirt off without taking the varnish and paint with it.

"If the automobile owners knew how important it is to keep the dirt from hardening on the surface of the varnish, they'd often be willing to pay a little extra to get the car cleaned oftener.

"Just wait a minute and let me show you what I mean. Here is a car that happens to belong to one of



"The First Step in Washing is to Rinse off the Car with Clean Water"

those 'once a year bath fellows.' I'll give her the once over with the hose and then we'll examine some of the mud cakes and see what's beneath them."

The car O'Reilley has wheeled to the wash stand

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seems to be somewhat the worse for wear, the finish is dull and and lusterless, though the paint is still in good condition. O'Reilley turns the hose on it and after getting off the latest accumulation of dust calls us over. He points to a cake of mud just in front of the rear fender on the running board apron. He turns the hose on the dirt and lets it run against it for several minutes. After a time the cake gradually softens and finally slips off. O'Reilley takes a soft sponge and dries the surface and we look it over.

Even a casual examination shows that the varnish surface has been wholly destroyed underneath the mud and we can see that nothing but a new coat of varnish will ever give this spot a shine again. O'Reilley explains.

"A cake of dirt on an automobile will always accumulate oil. It doesn't matter where that cake happens to be, oil will find it and soak into it. The oil will work through the cake and attack the varnish. If you wash the dirt off right away the oil won't really get the chance to damage the finish, much, but if you leave the dirt on the finish for a time, then the oil attacks the finish and exposes the paint. You will always be able to see a spot on the surface."

"And now I guess you'd better be leaving here. I've given you enough information for your story anyway and if I stand here talking I'll have to put in some overtime tonight and if I don't get home to help the old lady with the wash tonight I'll have to sleep in the garage, it'll be the only safe place for me in the world."

* * *

And so we leave O'Reilley to his work. We'll hope that he treats all of his cars in the same way that he has handled the demonstration for us. We won't go back to visit Mrs. O'Reilley because she is probably just hanging the Wilkins' wash on the line and "blue" Monday is no safe day for visitors at the O'Reilley home.

WHY VALVE STEMS PULL OUT

Why valve stems pull out of inner tubes even when the tire has not been run flat, has caused considerable argument among car owners. The solution is a simple one and lies in evenly mounting the tire on the rim.

In placing a tire on a rim, the tube valve stem is inserted in the hole in the rim provided for it. Then the casing is, ordinarily, worked on the rim by successively prying it over the edges. This stretches that part of the tube where the prying is started and works an accumulation or surplus of tube at the end on the other side of the valve stem.

When the tube in this condition, is inflated, it cannot adjust itself, being stretched beyond a normal tension on one side of the valve stem and loose on the other side. When the latter side strikes the ground first, the over-stretched side exerts a heavy pull in the valve stem. This results, according to Miller tire service experts, in a blow-out from a pulled valve patch or a torn tube.

If the tire is run the other way so that the strained part of the tube hits the ground first, there is a slight tendency to relieve the excess strain. In such a case, the tube will probably last for a considerable distance.

Many motorists have noticed this condition in an excessive wrinkling in some part of the tube. The one and only reasonable preventative is to apply the tire on the rim evenly, working from both sides of the valve stem. In this way, there will be no more stretch and pull on one side than on the other.

SOME RATTLER

Recently a friend of ours bought a second-hand car of a "light and pop'lar brand," as Abe Martin would say. In a few weeks he discovered that it was a cripple on four wheels instead of the pleasure vehicle he expected. He was describing to us some of its numerous ailments.

"I gather, then," we commented sympathetically, "that she rattles quite a bit when you drive her?"

"Rattles!" he exclaimed. "Why, dammit, she sounds like a skeleton having a congestive chill on a tin roof!" —Driver Dan.

SOME DAYS NEVER ARRIVE

The campaign against high cost was like the old dodge of the Chicago saloonkeeper. He hung out a sign, "Free Beer Tomorrow." Men who saw it came in the next day for the free beer and the bartender politely told them to go out and read the sign again.

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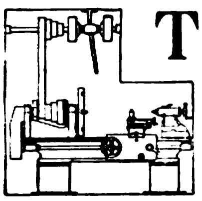
Small Jobs in Brass Casting

How the Repair Man May Duplicate Brass Parts Without Resorting to the Foundry

BY J. F. SPRINGER



THERE are a good many articles of *brass* needed, such as bearings, pipe fittings, etc. On occasions it may be simpler, cheaper and quicker to make the thing in the shop but small articles of simple form may be made without any great amount of special equipment.

One of the principal differences between molding iron and molding brass is the requirement that the brass mold, or its surface at least, shall be of finer sand. It seems that molten brass is thinner than molten iron and will find little crevices and the like in the sand. The effect is a rough surface. The preventive is a fine sand. The requirement as to fine grains of sand really includes absence of dirt. Anything that is present and that tends to provide surface crevices and voids is objectionable. So then the sand (on the surface) must be fine grained and very clean.

Another distinction between iron and brass molding consists in the fact that in the latter a more considerable allowance must be made for contraction during cooling. Other differences relate to the facings, parting sand and finishings. As to the blackening mixtures and the processes of drying and ventilating—these are substantially the same as with iron.

Melting the Brass

Of course, one must be prepared to melt the brass, and this requires heat. Naturally, one uses the fuel right at hand. City gas or natural gas is suitable. But heavier fuel may also be used. The furnace will be adapted to the fuel. The portable crucible is perhaps the most convenient thing for miscellaneous use. A crucible, if handled with reasonable care, may be expected to have a life of, say, 30 heats. A new crucible should be annealed before going into service. The crucible manufacturer may have annealed the furnace, but moisture will probably have been absorbed in the interval. This moisture is to be driven out carefully and slowly, A pair of special tongs is often used in lifting the crucible in and out of the furnace. The crucible, with its charge, may require re-setting from time to time, upon which occasions the tongs will often be useful.

Preventing Oxidation

In order to prevent the oxidation of the brass in the crucible, it is customary to put on top of the molten metal a layer of *powdered charcoal* or *powdered glass* or some equivalent. The idea is to keep the metal protected against the oxidation in the ordinary atmosphere.

Copper and zinc may be used in any possible proportions. Brass of some kind is the result. The more copper, the higher the melting point. A standard formula is 2/3 copper and 1/3 zinc, these proportions referring to *weight*. If a small amount of tin, say, 2 to 4 per cent of the total weight of the principal metals, is added, the brass will be improved in strength. The zinc in the brass has the effect of promoting fluidity. Sometimes a casting that is required will have small projections or be otherwise thin in places. If the case seems to require more than the ordinary fluidity, in order to be sure the molten metal will fill out these places, additional zinc may be added. But, when this change is made, it will be well not have the metal too hot when it is poured. Otherwise, it may boil or kick out of the mold.

The Ingredients

If possible, use the purest metal obtainable, and mix these in the melt. Copper almost perfectly pure is readily obtainable. I doubt whether zinc can be gotten as pure.

The mold facing for the brass casting may often be conveniently made in the following way. The ordinary sand used for iron work is too coarse, but one may sift it through a fine screen. The fine pieces which go through are what we want. This fine sand is then tempered and employed to give a *facing* to the mold. The bulk of the mold may be made from the unsifted sand—that is, from the sand in ordinary use. Sea coal or coke is not necessary as an ingredient in mixing facings. This is a distinction from iron molding. New molding sand that is quite fine and quite clean and that has been mixed to an even temper is a proper thing for the facings. When using it for this purpose, the fine, even sand is applied to the pattern surface by the use of a suitable sieve. The molds are to be rammed with their sand to just about the same degree as if an iron casting were in contemplation.

The Blackenings

The ordinary blackenings used in iron molding are advantageously displaced by such substances as flour, whiting, slaked lime, cement, powdered chalk, etc. The material selected should be used only in the form of a fine, even powder. This is necessary, in order that the pores or voids in the sand may be well filled up and the brass prevented from penetrating into the sand of the mold. At the joints, molds for brass may have match boards, plates, etc., just as in molds for iron;

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but the *parting sand* must be right or trouble is to be expected. Thus, it should not be anything that will coarsen the regular sand. *Powdered rosin* is recommended as a suitable material for the parting material at joints. Lycopode may be substituted.

The Drying of the Mold

A small mold may often be dried by simply wetting it with gasoline and then setting fire to the latter. Another method is to cover the mold with a red hot plate until the mold surface has become hard and dry. A gas jet is a suitable agent for drying a mold. So also is an ordinary burning lamp or burning rosin. These last methods have the advantage of applying smoke to the mold surface as well as drying it. When the gas jet is used, it may be placed inside the mold. When it is withdrawn, an iron plate is put on as a cover to retain the heat. In order to get the requisite degree of hardness with some sands, some workmen spray the surface with water that has been sweetened with molasses.

The Pattern

The pattern may be a single piece and quite solid. It may, in such cases, often be made from clay, wax, sand, plaster of Paris, or the like, provided the pattern is to be used but once.

Wood is the usual material where the pattern is to be used more than once, and is in fact to have a prolonged life. The simplest case is a *one-piece pattern.*

Sometimes the pattern may be one of the things it is desired to make. This may not often occur, because of the need to allow for shrinkage.

Suppose now that the thing wanted in solid brass is a simple roller which is diminished in diameter between the ends, and resembles a dumb-bell. This article may be made by the use of a one-piece pattern, and it doesn't

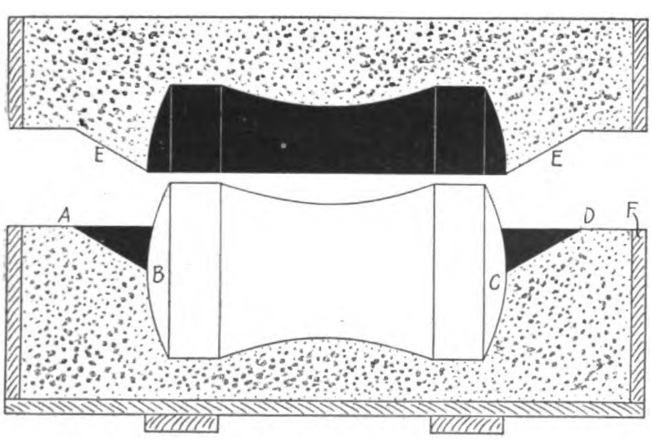

Fig. 1. Pattern Improperly Located Too Deep in the Flask, Necessitating a Projection of the Cope Sand as at E.

matter very much what material is used. The pattern will be easy to make. The molding arrangements may be carried out in several ways. We will assume that the roller is to be cast horizontal. I reproduce illustrations shown by the International Textbook Co.

In the accompanying illustration (figure 1) is shown the incorrect method. The pattern is seen imbedded half-way in sand contained in the lower half of the box or flask (F). It will be noted that the sand in this lower half—*i. e.,* in the drag—has been cut away at the ends of the pattern. This is necessary because of the convexity at each end. Otherwise, with the sand filled in to the top, the pattern could not be removed. Because the sand has been cut away along *ab* and *cd,* it is necessary that the sand in the upper half of the flask—*i e.,* in the cope—shall project downward in order to complete the mold. This down-projection will perhaps be objectionable in a good deal of work in an actual foundry, but may not seem so in a shop where the casting of a piece is only occasionally done. The most forcible objection perhaps is the one which centers on the necessity to make the *party surfaces* match. These are the surfaces of contact of the sand in the cope and of the sand in the drag. There is no difficulty where the top of the lower body of sand is flat and flush with the top edge of the drag and when the upper body of sand is likewise flat and flush with the bottom edges of the cope.

However, the pattern may be made in *two parts,* as shown in figure 2 with the view of facilitating the work of making the mold. To make the pattern for the roller, one selects a board somewhat greater than one-half of the thickness which the finished pattern is to have. Two pieces of this board are secured together by means of screws and wooden dowels and a roller made on the turning lathe. By proceeding in the foregoing way, one may produce a split pattern. The screws are so placed as not to be involved in the finished roller. The dowels, on the contrary, are so placed that when the roller is finished, it may be taken apart and put together with their aid. The hole for a dowel will naturally be partly in the one board and partly in the other. One may bore all the way through the one and partly through the other.

The pattern as now made may be so used that one-half will penetrate the sand above and one-half the sand below. The parting surfaces may now both be perfectly flat and perfectly flush with the edges of cope or drag. This makes a simple molding operation as such surfaces will then be a single mass of sand with no inside cavities except the ones wanted.

Sand

The sand required for small articles of brass should be quite fine. Such molding sand comes particularly from the neighborhood of Albany, N. Y., but from other places as well. If the sand is very fine, it will answer both for mold and for core. A special binding material to hold it together may be necessary for cores. If so, resin, wheat flour or the like, may be used. The sand should be *tempered*—that is should be so mixed that any small sample will be the same, wherever taken. The sand is dampened evenly until it is judged to be right in condition to maintain itself when indentations are made.

The two parts of the flask should be made so as to

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match exactly when put together. Pins and sockets may be used to facilitate placing the one on the other in exact position.

Molding

The facing sand is to be arranged next the pattern and may have a thickness of, say, 1 inch. The ordinary sand will then be filled in round the pattern. The sand

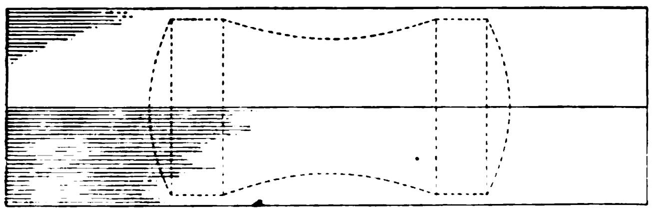

Fig. 2. Easiest Way to Cut Pattern from Two Pieces of Wood

in general is to be well rammed in the box, care being taken not to damage the sheath of facing sand next to the pattern.

The half pattern is placed on the molding board, which temporarily forms the bottom of the drag. Later on, the drag is to be overturned and this molding board removed. The half pattern is laid with the *joint surface* flat down against the molding board. There should be but little trouble experienced in encasing the half pattern first with the facing sand and then with the ordinary sand. Before turning the drag over, after it has been filled and rammed to the top, it is covered with its proper bottom. The latter is secured firmly in position.

After the drag has been overturned and the molding board taken off, the surface is gone over with a trowel in order to *sleek* the surface until it has a fine finish. Any fine dust remaining may now be brushed off. The other half of the pattern is now fitted on to the half embedded in the sand in the drag. The parting sand is now spread over the surface very evenly. The object is to use a dry material not liable to adhere to anything; so that when the two bodies of damp sand are later put together, the two damp surfaces will not stick to each other, because in reality separated by the non-adhesive parting sand.

The Cope

The cope is now set in place. Facing sand is put over the pattern just as before, and the usual sand filled in. The filling is to be well rammed into a compact whole. The inside walls of the cope are to be wetted with water before it is put on the drag. The object in wetting these surfaces is to prevent the body of sand, later on, from dropping out when the cope is being lifted away or is being brought back again. A rod is set in place at the proper time, so that when the cope is being filled a gate or sprue will connect the upper surface of the sand in the cope with the mold cavity. Through this the brass flows and fills the mold. One or more wires may be put in place to mold openings for the escape of air and gases during the pouring operation. Also, a riser pin may be put in. After these passages are provided for and the cope filled and rammed, the cope is removed, leaving the pattern half buried in sand.

Swabbing

When the joint surface in the drag half of the sand is now exposed, it is prepared for the casting operation, (1) by having its surface brushed clear of loose and dry sand, and (2) by having a damp swab passed over the surface. After the pattern also has been swabbed, it is gently tapped and then removed. The cope with its body of sand is returned to its place on top of the drag. After this, the casting may be poured.

REFINISHING AN AUTOMOBILE

If the finish of a car is cracked or in such bad condition that it must be taken off and an entire new finish applied, it is best to have the job done by a professional auto painter.

But if the finish is sound but dull and lusterless in appearance, it is an easy matter for the owner himself to brighten it up if he can devote a few hours' time to it. The materials should cost less than five dollars.

The body and chassis should first be washed with lukewarm water; then thoroughly dried. If the work is to be done out of doors, it should be on a clear, dry day when no wind is raising dust.

If the old finish has not faded, but is simply dull, it can be brightened up with a coat of clear finishing varnish. Where the old finish is both dingy and faded, it is better to apply a coat of enamel of the same shade.

This is sufficient unless the amateur desires an extra fine finish, in which event either the varnish or enamel coat may be gently rubbed with a soft woolen cloth, using pumice and water. This should not be done until the coating has dried for at least forty-eight hours.

Now flow on a final coat of clear finishing varnish, using extreme care to see that no dust is present.

It is surprising what a difference this simple treatment makes in the appearance of a car.

Creaky wheels come from loose hub or rim bolts, or both, but no rim bolts can be kept permanently tight when the rim is bent sideways.

Quit worrying. You cannot stop what is going to happen and you only weaken the whole nervous system by thinking too much about it. Nothing to gain and all to lose by worry.

Bright colors have much the same effect upon the eye that bright music has upon the ear. Both cheer up. Brighten up your store all you can. It makes it easier to sell goods.

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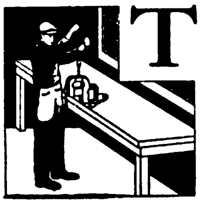
A B C of the Automobile

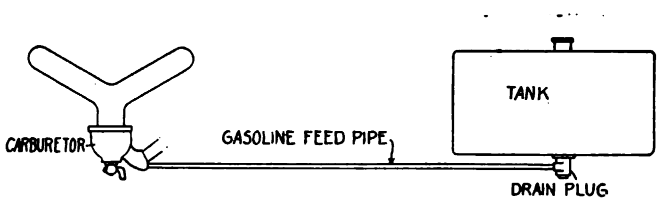
Description of the Three Fuel Systems and Their Function

By Robert A. Chandler, S. A. E.



THERE are three systems for supplying gasoline to the carburetor: the gravity, pressure, and vacuum systems. The first one to be used and the simplest is the gravity system. The tank is placed under the front seat, as on the Ford and a few other cars, and so runs down to the carburetor by its own weight. Naturally the carburetor must be set low, so that it will always be below the level of the tank, especially on an up-grade.

This necessitates a long inlet manifold which is an objection, especially in winter, as the vapor is chilled and condensed by the cold air striking the pipe. This causes the gasoline to collect in the inlet manifold and thins the mixture to a point where the engine cannot fire it. Even if the engine runs, some of the gasoline still clings to the inlet manifold and runs down and is wasted as soon as the engine stops. The suction holds it up in the pipe and so it runs out when the engine stops. This is wasteful and reduces the power, besides



Gravity System

adding to the fire risk from the gasoline dripping into the pan under the engine. Water-jacketing the manifold is only a partial remedy as it takes some minutes to warm the water after starting and later the manifold may become too hot, reducing the power again.

The trouble due to the gasoline not reaching the carburetor is especially likely to occur if the supply is low in the tank and the grade is unusually steep. In this case there is nothing to do but turn around and run backwards, unless sufficient gasoline can be obtained to fill the tank again. To avoid this trouble some manufacturers mount the tank in the cowl dash which places it very much higher and very nearly over the carburetor. This enables them to shorten the inlet manifold, which is a double advantage. There is a slight chance of damage to the tank in case of collision, but this accident is rare.

On its way to the carburetor the gasoline sometimes passes through a sediment bulb or water pocket and a strainer. The bulb should be opened occasionally to remove sediment and water and the strainer cleaned. The pipe may become clogged, especially at bends and elbows, but in other respects the system has the advantage of simplicity. Make sure always that the vent hole in the filler cap is open or the flow of gasoline will stop.

The Pressure System

This system was devised to allow a larger tank to be used than was possible where the location is under the seat, the only other place available being back of the rear axle and consequently below the level of the carburetor. This is not in any special danger from collision as the overhang of the body and the tire bracket protect it. As large a tank as may be necessary may be installed—a great advantage on a heavy car. The first pressure system devised trapped some of the gas from the exhaust manifold by means of a check-valve, passing it through strainers, and leading it to the tank.

As the exhaust gas frequently contained oil and carbon the strainers and valve became choked, requiring too frequent attention. This method is no longer used, an air pump, driven by the engine, having taken its place. As the pressure must be kept up at all times a gage on the dash serves to inform the driver. One and a half to two pounds are usually carried. The filler cap on the gasoline tank has no vent and must be closed with a wrench so as not to allow the pressure to escape. As the pressure is lost when this cap is removed to fill the tank, some means must be provided to restore it before the engine can be started and so a hand pump is placed on the dash. Usually there is enough gasoline in the carburetor to run the engine and restore the pressure, but if the engine stalls the hand pump must be used.

Some systems provided a small tank on the dash through which the gasoline had to pass in order to reach the carburetor. To prevent overflow a float shut off the supply when the tank was filled. From here the gasoline ran to the carburetor by gravity. As the extra tank was only an added complication not really needed, many manufacturers have done away with it, the gasoline passing directly from the rear tank to the carburetor. To prevent dangerous pressure in the tank a blow-off (safety) valve is usually located in some part of the pressure pipe.

This is really a simple system with very few working parts and consequently few troubles. Leakage of pressure may occur at any part of the line but especially in the pump and at the filler cap, unless this is set

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up with unusual care. Even if the pressure does leak out over night, a few strokes of the hand pump bring it back to normal and it remains there all during the day. But on account of the trouble due to leakage the third system was invented.

The Vacuum System

This system uses the suction which is always present in the inlet manifold, requiring no special apparatus like a pump to produce it. A tank is provided which sets on the dash under the hood or is fastened to the engine almost over the carburetor, so that there is always enough drop to the gasoline to reach the latter. The tank consists of an upper (or inner) compartment and a lower (or outside) one, the upper one being provided with a float and three valves to control the suction or to admit atmospheric pressure as may be required. Three pipes lead from the top of the tank; one to the fuel tank at the rear, one to the inlet manifold, and the third simply leads to the outer air but is usually carried to the highest point possible on the dash, under the hood. This is merely to prevent the gasoline from flowing out of the vacuum tank on a steep descent in case the rear tank is higher than the vacuum tank. A pipe from the bottom compartment leads the gasoline to the carburetor, through which it flows by gravity. A drain-cock on the bottom of the vacuum tank serves to draw off the water or sediment which may accumulate there.

The operation of the system is extremely simple. When the float is down the suction valve is open and the suction from the inlet manifold draws the air out of the upper compartment. Atmospheric pressure forces the gasoline up from the rear tank, which must have a vent in the filler cap. It flows up and into the upper compartment, raising the float. At the end of four seconds this is filled and the float operates the two valves in the top. The suction valve closes, shutting off the suction from the inlet manifold. The air valve lets in the atmospheric pressure. As there is now nothing to hold the gasoline it forces open the flapper valve by its weight and the upper compartment empties into the lower from which the gasoline immediately flows to the carbruetor. As it runs down the float is lowered and at a certain point again operates the two valves in the top. The suction valve opens and the suction from the inlet manifold exhausts the air from the upper compartment.

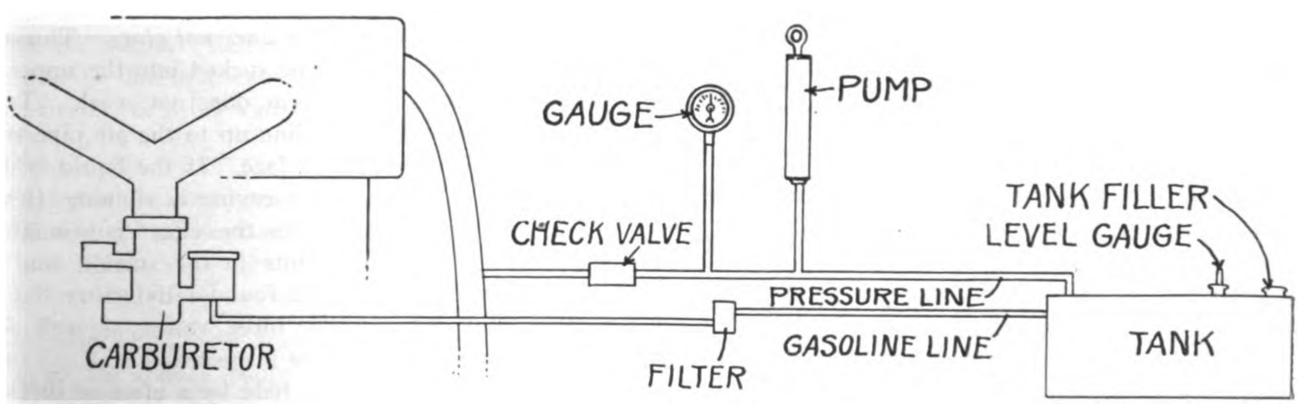
The outside air is prevented from entering by the atmospheric valve at the top, which has been closed by the float, and by the flapper valve at the bottom, which is kept closed by atmospheric pressure. After four seconds the upper compartment has been filled and so the float again operates the two valves at the top and the gasoline flows into the lower compartment by its own weight. After a few such operations the two tanks are filled and the float rests on a solid body of gasoline extending all the way down to the carburetor. As the gasoline is used up the level drops slowly until the float has moved far enough to operate the two valves, when the upper chamber is immediately filled again.

This action, as will be seen, is entirely automatic and so requires no attention from the operator. The vacuum tank is always kept filled and so the engine is always ready to start and there is no necessity for any pumping of gasoline or other care after the rear tank has been filled. If the vent in the filler cap is kept open and the joints are kept tight there will be very little trouble from the system.

A Special Case

A special case arises, however, when all the gasoline is used up through inadvertence. The gasoline has been all drawn out of the rear tank, the vacuum tank has been drained, and there is not enough in the carburetor to run the engine. The driver fills the rear tank as soon as possible, but the gasoline is useless there so far as running the engine is concerned. In some types of carburetor it is easy to pour enough into the float bowl to run the engine for four or five seconds and fill the upper compartment of the vacuum tank, after which the system will take care of itself. The manufacturer has provided for this emergency by placing a small plug in the top of the tank which may be removed and a cupful of gasoline poured in. Be extremely careful to have this plug set up tight when replacing, otherwise the system will suck air and so may fail entirely.

If the suction line is tight a simpler method of starting the system is possible. All that is needed is suction, so we press on the starter pedal to turn over the en-



Pressure System

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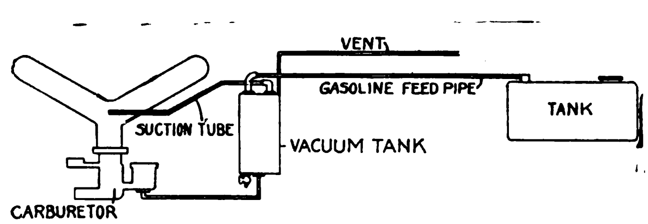
gine a few times. It will be an advantage to close the throttle so as to increase the suction as much as possible. This is because the starter does not crank the engine as fast as it runs under its own power and so the suction in the inlet manifold is not so great. At the end of five or six seconds the throttle may be opened and the ignition switch turned on (if not already set) and the engine will start. But if there are leaks in the suction line this method may fail and the vacuum tank will have to be primed through the opening in the top.

Troubles of the Vacuum System

The following list of troubles of this system would seem to be formidable were it not for the fact that they seldom occur. They should be regarded as possibilities rather than as probabilities.

1. *Clogged Strainer* where the gasoline enters the upper compartment. This is the most frequent trouble and probably the only one you will ever have. The strainer is placed in this position to keep out dirt which would cause far more trouble if it got into the carburetor. As the strainer clogs up the gasoline passes through slowly or not at all. The first warning we have is due to the sluggish action of the engine. It runs well enough throttled down, because enough gasoline passes through the strainer. But the engine does not respond readily to the throttle because the gasoline does not feed in fast enough. The throttle is similar to the one previously described under clogged strainer in the carburetor.

If the vacuum system is used the strainer in the vacuum tank should be examined first. To remove it, disconnect the union in the pipe and unscrew the nut that carries the elbow. The strainer may now be removed and cleaned. Be careful in replacing it to tighten all joints or you will only remedy one trouble by causing another. If the joints leak air we come to the second trouble.



Vacuum System

2. *Leaky Joints in the Suction Line* (from the upper compartment to the inlet manifold). A slight leak is not serious as there is more than sufficient suction in the manifold to take care of it. But if this increases or another joint starts leaking it may become serious as the float chamber will not fill with gasoline. This may be detected while the engine is running by squirting oil around the joints. The leak will be shown by the oil being sucked in. Tighten the joints. If this does not stop the trouble disconnect the parts and fill the threads with soap or graphite and shellac. Do not use red or white lead as it makes a permanent seal which may damage the threads if it ever becomes necessary to undo the joints again.

3. *Leaky Joints in the fuel line.* These are easily discovered by gasoline dripping from them. If tightening does not stop the leak, try filling the threads with soap as above described. This is not soluble in gasoline and so will frequently stop a leak where nothing else will.

4. *Leakage around the Gasket at Top of Tank.* This is rare, but may occur if the gasket has been damaged while removing. It will prevent the tank from filling and so is similar to a leak in the suction line. These parts should be tested at the same time. Run the engine and squirt oil around the gasket. If found defective a new gasket should be used, but the old one may sometimes be patched up by a liberal use of shellac.

5. *Leaky Vacuum Tank.* If the leakage is in the outside tank it is readily detected by the drip. If it is only a small leak it may be soldered, but if the solder will not hold, try coating it with sealing wax. Hold the tank over the flame to heat it and place the sealing wax inside. Give it a coating of a sixteenth of an inch or more. Such a repair has been found to last several years. A leak in the inner compartment can only be determined by inspection. Of course the system will not work and the usual tests are made for leaks. If everything is found to be tight the tank is opened to examine the valves. If they seem all right it will be well to hold the flapper valve closed and fill the inner tank with gasoline. Any such leaks will then be discovered. A very small leak in the inner tank will not prevent it from filling but will slow down its action, so that the engine will use up the gasoline faster than the system can supply it.

6. *Valves do not Close: The Suction Valve.* The suction valve may be worn or have dirt in it. The effect is to suck gasoline at all times. Unless the air inlet is clogged the suction will hardly be strong enough to draw gasoline into the inlet manifold (see Leaky Float, below). But it draws gasoline vapor into the manifold, making the mixture too rich and so giving weak power. It is also shown by the exhaust gas being more pungent (stronger) than usual. The blame is usually laid on the carburetor, which is then adjusted for a leaner mixture—only a partial remedy as it will not be correct for all speeds. If adjusting the carburetor does not correct the trouble the suction valve should be examined.

7. *The atmospheric valve does not close.* This allows air instead of gasoline to be sucked into the upper compartment and so the system does not work. Test by holding a tumbler of gasoline up to the air pipe so that the end dips below the surface. If the liquid is drawn up into the tank when the engine is running, it shows that the valve is open. As the effect is similar to a leaky gasket or leaky joints in the suction line these are usually tested first. If found satisfactory the inner tank is removed and the three valves as well as the walls of the inner tank are inspected.

8. *Flapper Valve Open,* held by a piece of dirt or by particles of carbon which accumulate on the seat. Nat-

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urally the upper tank cannot fill as the air rushes in from the lower tank and so prevents the gasoline from being sucked in from the rear. Test as follows: disconnect the feed pipe from the vacuum tank to the carburetor. Have enough gasoline in the carburetor to start the engine. Close the air tube by a plug or by the finger. Start the engine and see if suction shows at the lower feed pipe. This may be tested by the finger or by holding a glass of water up to it. If the flapper valve is tight there will be no suction in this pipe. The test previously described, holding a glass of gasoline to the air pipe may be used here, but there is then a doubt as to whether the air valve or the flapper valve is leaking. This does not much matter as the inner tank must be removed in either case. Dirt on the seat of the flapper valve may be scrapped off with a knife, due care being used not to make the seat so rough that the valve will not be tight.

9. *Heavy float.* Once in a great while the float springs a leak and takes up gasoline. It is then too heavy to rise to its proper position and so the suction valve remains open. As soon as the upper tank has filled the gasoline is sucked into the inlet manifold and is fed in the liquid state to the engine. This gives weak power and a trail of black smoke from the exhaust. If the carburetor adjustment seems all right remove the float and test for leaks. Gasoline inside the float may be detected by shaking it. The testing and repairing of a metal float has been described under carburetor troubles.

10. *Bent Guide Rod.* Be extremely careful in handling the float not to bend the guide rod at the bottom. If this is bent the float cannot move freely and so the system will not operate. This defect can only be determined by inspection.

11. *Water or Sediment in Lower Tank.* If water is found in the carburetor there will be some in the bottom of the vacuum tank. This is easily removed by the drain valve. Catch some on the hand to make sure. Sediment accumulates on the bottom but will not be entirely removed by opening the drain valve. Draw off all the gasoline and leave the drain valve open. Pour a pint of gasoline in at the opening in the top of the tank. The flapper valve will spray it over the bottom of the lower tank and so clear it out. Strain the gasoline through a fine wire cloth before returning it to the tank.

12. *Overflow from the Air Pipe,* when back-firing occurs in the carburetor. This is not a defect and should occasion no alarm. Remove the cause of backfiring, which may be due to a leaky inlet valve, a lean mixture, a short-circuit, or other cause.

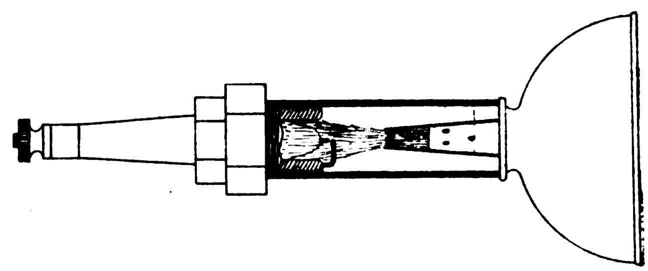
Once in a while a man who offers readily to accommodate you with a loan has nothing at all in the back of his mind.

The reason why a man draws a large salary is because he wanted the money badly enough to pay the price for it.

A SPARK PLUG CLEANER

By GEORGE A. McVICKER

A VERY serviceable spark plug cleaner which I made out of an ordinary ten cent oil can is shown below. I cut off one-half of the pointed spout and placed it into the end of the remaining part of the spout and cemented it with shellac bristles cut from an old paint brush leaving them extend one and one-half inch outward. Near the base of the spout I



A Handy Spark Plug Cleaner

punched several small holes through which gasoline would pass when the oil can was inverted. Then securing a piece of tubing just large enough for the threaded end of the spark plug to slide into, I attached it over the part of the spout on the can by soldering it to the knurled rim at the base of the spout.

To clean a plug it is only necessary to insert it into the end of the tube and the can is inverted. The gasoline flows to the bristle and by turning the plug in the tube it is thoroughly cleaned.

(Editor's Note: The above article was printed in the January issue of the magazine without this cut. Several readers have written in suggesting that the description would be clearer if illustrated, and to that end we have had the drawing made to accompany it. We are therefore reprinting the article.)

THE MODERN PUZZLE

Chug-Chug! br-r! br-r! Honk! Honk! Gillgillug—gillillug.

The pedestrain paused at the intersection of two streets. He looked about. A motor car was rushing at him from one direction, a motorcycle from another, a steam truck was coming from behind, and a taxicab was speedily approaching.

Zip-zip! Zing-glug!

He looked up and saw directly above him an airship in rapid descent.

There was but one chance for the poor man. He was standing upon a manhole cover. Quickly seizing it, he lifted the lid and jumped into the hole just in time to be run over by an underground train.—Los Angeles Times.

When introduced they tell us how delighted they are to meet us, and the next time we run across them they are gazing at the sky.

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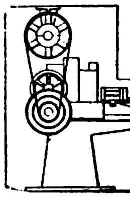
Hints on Tire Repairing

Various Suggestions Which Are of Help to the Tire Repairman

By F. H. Sweet



THE day of the unskilled repairman has gone. He is rapidly being replaced by the tire surgeon, skilled in his work and rigidly adhering to certain fundamental laws which underlie it. One day I called upon a repairman who had asked that an expert be sent to him at once. The repairman was having trouble, although he had had long experience in the business. Carelessly he had raised the steam pressure contrary to specifications, so that a cracking of tread material resulted.

When questioned about this he replied: "Oh, I know 40 pounds of steam is specified for this cure, but it takes too long. Sixty pounds lets me get out more work. In this way I shorten the time of curing."

Expert advice had been disregarded, and yet good results were expected.

At another shop a man had had special training and had been taught to cut his fabric on the bias, had been given the reason for doing so and had been assured that excellent results might be expected from this method. Nevertheless, he was found cutting the fabric straight.

These are only examples of conditions too often met with. In some cases lack of knowledge of tire repairing is the trouble. In others it is the disregard for established rules which had been taught. Now a man working a problem in addition would not expect to get correct results if he applied the rule of multiplication. The same principle holds in repair and vulcanizing work. Certain things are known absolutely to be true. It is the interest of the tire repair man—tire surgeon—to get behind a movement, thus increasing the confidence of the tire using public, that will result in better tire repairing. It is a good plan to give the following idea two or three months trial for comparison with past records. Make the repair shop something pleasing to the customer both in appearance and workmanship. Devise a systemactic way in which to carry on repair and vulcanizing work. Check up shop leakage.

Another Shop

Consider this other shop. Its proprietor has been a very busy man who operated a large service station and an accessory store in connection with the repair shop. The repair department was left entirely to the foreman; the owner seldom visited the work room. While going through this room a small box of uncured trimmings was noticed. The box contained a mixed collection of black, white and gray tread gum, building fabric, dust and dirt, together with dried cement. Two full barrels of this same collection was found practically valueless. It probably weighed 400 pounds in all. This material, had it been kept free, separated and clean, would have been worth approximately $200. As it stood, $30 would have been a good price. There was, therefore, a waste of $170. This is but an example of many similar kinds of leakage. If the vulcanizer expects to get results and profit that are rightfully his, it is absolutely imperative to check up on these things.

A practical method of putting fabric in a section where there is a very large hole, or where there is nothing much left but the beads, is to cement the iron core and stitch a ply of fabric down to it. Set the tire over it, stick the beads fast to the core in the usual position. This gives a natural foundation on which to build up the section in the ordinary manner. All the chafed and dirty fabric should be trimmed off around the beads. With this method the correct size and shape of the casing may be maintained.

Preparation of a Casing

Recently in a neighboring repair shop, the operation of preparing a casing was carefully noticed. The old tread was worn, loose and badly cut up. The repair man skinned the old tread off, buffed the carcass and cemented it. Several places were seen where water and dirt had soaked into the fabric. When buffed the old fabric was white and lifeless and rotten. These places, if not watched, will soon develop separation or loose spots. It is a much better practice to step out a patch at this point and replace it with a clean, new piece of material. In taking this precaution many tread separations will be prevented.

It is poor practice to place the hand on uncured stock while sticking it on the casing, as this will imbed dirt in the material. The sweat also takes away the tacky condition of the stock. Do not handle repair material any more than can be helped.

A section was cut down, the casing buffed and then washed, the rag was very heavily loaded with solvent and the old material and fabric were heavily saturated. After allowing it to stand a very few minutes, cement was applied. As a result a very porous condition developed in the cure, as the solvenut had not entirely evaporated. In washing casings, merely use a slightly moistened rag to clean out dust and dirt.

In making a cure on a sectional retread job a

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Virginia man found that the old breaker strip, apparently sound and good, would come loose, spoiling the job. He inquired what might be the cause of the difficulty.

There are several possibilities. One is that tread cuts when left to care for themselves, permit water to soak into the carcass and destroy the texture of the breaker. Cement condition not thoroughly dry or oil in solvents will also loosen the breaker.

A great deal of trouble in handling air bags is due to improper application for the most part. In handling old stretched casings and poorly fitting bags, the repair man should take care to pad the air bag to fit the casing. The reason for this is that air bags should spread the beads of the casing three-quarters of an inch before it is properly fitted. The bead molds are then applied and the clamp screw turned into the cavity mold fits snugly to the walls of the casing. Then the air bags should be inflated five pounds and the clamp screw given a three-quarter turn. Now inflate the bag to the proper pressure. Be sure that the air bags are centered in the molds so that only the heavy ends protrude beyond the ends of the cavity.

Solvents continue to give vulcanizers as much difficulty as any one thing in the process of repairing. Much of the faulty curing is due to impure solvents. Care should be taken to obtain the purest sort of solvent on the market free from all traces of oil. In washing stock and thinning cement, traces of oil do damage that makes a perfect job impossible.

Another repair man asks this question: "Should one or two plies of cord be left when a blowout is being repaired?" Cords in the cord tire are laid in groups and must be removed as such. For instance, remove the two sets of plies as follows: Inside first, then the outside group. This will allow replacement.

A repairman asks how many plies of cord there are in cord tires. A 3½-inch tire has four plies; a four inch, six plies; a 4½-inch six plies, and a 5-inch tire eight plies. A vulcanizer often queries: "How can I tell if the job I finish is cured, under-cured, or over-cured?" When a tire is over-cured, it is very hard and firm, and if tried with a pencil, gouges out in small chunks, while if the job is under-cured, the pencil jabs will remain and show as dents in the rubber. If properly cured, the tire will not show where the pencil jabs were made and will cure with a fine "bloom."

REASONABLE

A motorist put up at an English inn.

He had just bought the car and did not hesitate to brag about its capabilities to the innkeeper.

The following morning, however, when he called for his bill, he gazed at it in consternation.

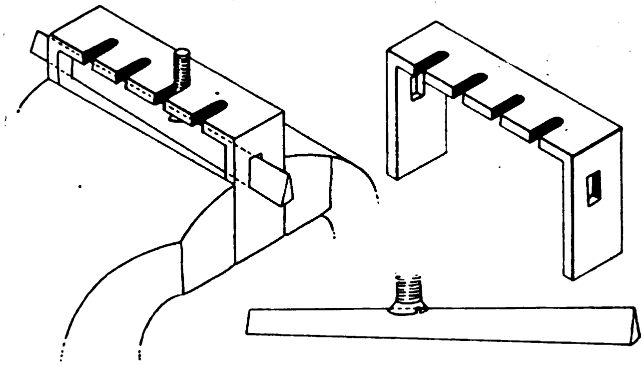
"Landlord," he called out, "I've been very comfortable here all night, and your charge for bed and breakfast is very reasonable, but what's this—80 shillings for housing my car in your stables?"

"Well, zur," replied the innkeeper, "Oi've not had one stop 'ere afore, and I didn't exactly know what to charge, and as yer were a-telling me that it has 40-horsepower, Oi charged 2 shillings a night a horse, as Oi allus charge."

NOVEL SCREW VISE

By Chas. H. Willey

OFTEN it is necessary to re-threa small screws or to hold them while filing or cutting them off. A special home-made tool for this purpose is shown in the



A Unique Screw Vise

sketch, and is made in a short time from a couple of pieces of flat bar stock. The sketch explains the construction.

PROTECT INNER TUBES FROM RUST

WHAT'S this—a joke? Who ever heard of rubber rusting? Well, of course, it doesn't but it is often injured by rust just the same.

Allowing the rim to become rusty injures the inner tube more than it does the rim itself. Rough particles of rust and scale from the rusty rim sift down into the shoe and act like sandpaper on the tube.

For the sake of the tubes, an occasional coat of aluminum paint should be given the rims when the tires are off. This will prevent rust and greatly prolong the life of the tubes.

Advertising is an insurance policy against forgetfulness. It compels people to think of you.

LOST HIS DICES

A negro soldier coming back to the dressing station with his right hand missing was seen to stop suddenly and start briskly back towards the front. When questioned as to why he changed his mind, he said:

"Well, sah, I was starting back to find mah hand."

"But," he was told, "you can't grow it on again."

"No sah, but mah dices was in dat hand."—*Cotton-yarns.*

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Starting and Lighting Systems

Definition of the Generator, Its Parts, and the Work They Do

By Richard A. Chadwick

THE generator, or dynamo, may be defined as a mechanical device to produce electricity by cutting the lines of force in the field between the poles of electro-magnets. This long definition is necessary to distinguish it from the battery, which is a chemical device, and the magneto, which uses permanent magnets. This distinction is also brought out by the following tabulation:

Source of current	Chemical	Dry cell	
		Storage battery	Used together
	Mechanical	Dynamo	
		Magneto	

The names "generator" and "Dynamo" are interchangeable, the former being the one most used in automobile work. We shall use both names so that the student may become familiar with them.

The essential parts of the generator are as follows:—

1. The frame or yoke, consisting of soft, magnetic iron, so shaped as to make a path for the lines of force. When the windings are properly fitted and a current is passed through them the frame becomes the core of an electro-magnet.

2. The pole pieces. These are pieces of soft, magnetic iron, bolted securely to the yoke and shaped so as to set closely around the armature. They thus become the poles of horse-shoe magnets, serving to concentrate the lines of force in the space between them, called the "field." If the pole pieces are removed for any reason it is extremely important in replacing them that no dirt get between them and the yoke and that they make a snug fit, otherwise the magnetism will be weakened, the strength of the field will suffer, and the generator will produce less current.

In the most efficient types the pole pieces are built up of thin plates, called laminations. This is to do away with eddy currents, as explained below. Sometimes one edge of each piece is shaped like the teeth of a comb, the effect being to intensify the field along that edge.

3. The field windings. These are long copper wires, properly insulated, which are wound into coils and slipped over the pole pieces. When the current passes through them the magnetism enters the pole pieces and yoke and the whole assembly becomes an electro-magnet. This is due to the fact that a wire carrying current is surrounded by magnetism (lines of force) which passes through the insulation as if it were not there.

When the wire is wound into a coil the lines of force are concentrated. If this coil is placed around a core of soft iron the action is intensified and we have an electro-magnet. Evidently the wires should be carefully insulated as any leakage of current would weaken the field by depriving it of some of its magnetism.

4. The armature is the part which produces current. As it revolves in the field between the poles the wires it carries cut the lines of force and so produce current, as will be explained later. This current passes to the commutator and is carried off by means of brushes. The essential parts of an armature are: the core, the windings, and the commutator.

5. The core of the armature consists of a series of very thin discs (called "laminations") of soft iron, bolted together. If a solid piece of metal were used, what are called "eddy currents" would be produced which would weaken the action of the armature. By coating each lamination with japan varnish they are prevented from making electrical contact and so no current can flow from one to the other. Soft iron is used, as in the yoke and pole pieces, as it offers a ready path for the lines of force passing from one pole to the other.

The laminations are slotted at the edges to receive the wires with which the armature is wound. They are held together by a bolt passing from end to end through the center. In some arrangements the slots are placed in line with the bolt, so that they run straight from end to end of the armature. In others they are placed spirally, that is, they overlap slightly so that the slot tends to pass round the armature, but only for a short distance. The end of one groove never passes beyond the beginning of the next. The object of this arrangement is to give greater smoothness to the production of current.

Windings of the Armature

6. The windings of the armature consist of insulated wires laid in the various slots. One winding occupies two slots (on opposite sides) and no more. The ends are brought out and soldered to the commutator bars. The end of the adjacent winding is also soldered to the same bar so that all the windings are connected in series. By this means all the current made in a certain part of the armature may flow to one spot on the commutator and be removed by the brush.

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7. The purpose of a commutator is to change the alternating current produced in the windings into direct current and to pass it to the brushes. It is built up of a series of copper bars separated by thin plates of mica, which serve to insulate one bar from another. It will be noticed that the edges of the mica do not come to the surface of the commutator but are cut down for a short distance. This is because the copper wears faster than the mica and so the latter would soon stand higher than the copper, making a rough commutator on which the brushes could not fit closely.

This would cause excessive sparking between the two which would burn them badly and so make matters worse. Being undercut, as they are, the generator may be run for a year or more before the commutator will need to be trued up and the mica undercut again. The commutator collects the current being generated in the windings and so passes it to one of the brushes. But as the current generated in the armature must return to its source, the commutator receives it on the other side through another brush. Thus one brush carries away the current and another returns it.

Commutators are only found on the armatures of direct current machines (dynamos or motors). On alternating current machines collector rings (similar to the one on a magneto) are used instead.

8. The brushes used on generators are composed of amorphous carbon (such as gas-house coke) with a small percentage of graphite (crystalline carbon) to serve as a lubricant. Carbon is the favorite substance for brushes as it is softer than the copper of the commutator and so does not wear it away so fast. Carbon brushes are also more readily shaped to conform to the surface of the commutator. Again, it has no tendency to weld to the commutator as has a copper brush in case of sparking. But the principal reason for the widespread use of carbon is the fact that with it, sparking is reduced to a minimum.

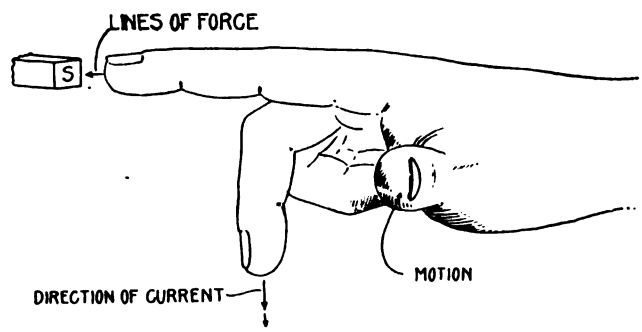
This is because of the high electrical resistance of carbon which prevents short-circuiting the windings as the brush touches two adjacent commutator segments. As sparking is exceedingly injurious to both to the commutator and the brush it will be seen that this is a great advantage.

The "Pig-Tail"

Many types of brushes have a short piece of stranded copper wire (called a "pig-tail") fastened to them to carry away the current. Make sure that this is not broken and that the end away from the brush is fastened where intended. If the pig-tail is loose or broken the current has to pass through a spring or other part not intended, which has too high a resistance, so that the current is reduced in strength and the output of the generator suffers.

We must now see how these parts work together to produce current. The action is based upon a fundamental law of electricity that when a wire cuts lines of force, current is produced. It does not matter whether the wire moves, the lines of force move, or they both move, as long as there is relative movement between the two. But it must be understood that the lines are not actually cut in the sense that they are separated as, for example, is the case when cutting a piece of string.

The wires pass through the lines of force and these pass through the wires. The best comparison is the cutting of a ray of light by a piece of clear glass. The glass passes through the ray of light and this passes through the glass. To be sure, each one affects the other slightly, through refraction, which may be compared to the electrical effect when lines of force and conducting wires cut each other. The same electrical action takes place in the induction coil and in the magneto. In the induction coil the wires are stationary and the lines of force move out and back from the primary winding, producing a current in the secondary winding. In the magneto the wires move as the armature revolves. But the lines of force are twisted out of shape by the core and then straighten themselves so that we have them both moving—the lines of force as well as the wires. The action is similar in the dynamo, except that the lines of force remain more nearly in the same position, being twisted in proportion to the speed of the armature.



Direction of Lines of Force as Related to those of Current and Motion

Having established the fact that the lines of force and the wires cut each other, and having shown the method by which it is done, that is as far as the explanation can go. No one knows why a current is produced. It is simply a natural law, like gravitation, which we must accept as it is.

Right here a special caution is necessary. We speak of "making" or "producing" electricity. But it is now generally accepted that neither matter nor force can be created or destroyed. And as electricity seems to be midway between matter and force it must already be in existence. Then all our battery or generator does is to collect it at the positive pole, from which it is trying to escape so as to return to the negative. This creates a pressure at the positive terminal which we call "potential" or "voltage."

When the two terminals are connected by conductors, the pressure is relieved. This may be compared to the action of a water pump which does not create water but simply raises it to a higher level making a pressure or "head of water." When the water is allowed to escape it flows back and may be made to do useful work on the way, just as the electric current may be made to do work as it flows. We are accustomed to speak of the electric current as "flowing" but we do not know that any actual

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"flow" takes place. So, having grasped the fact that electricity is not actually created, let us return to our generator.

We shall now take up the rule for the direction of the induced current. Imagine this page laid on the North pole of a large magnet: then the lines of force would pass upward through the paper. Now lay a pencil on the page with its point towards the top. This represents a conductor. If the conductor is moved to the left the current will flow towards the point of the pencil.

This may be easily memorized by the well-known right-hand rule. Hold the thumb, first, and second fingers at right angles to each other. Let the thumb represent motion, the index finger the lines of force, and the middle finger the conductor. If it will make it easier to remember, imagine the first finger pointing toward the south pole of a magnet. As the lines of force leave by the North pole and enter by the south pole this makes your finger represent the North pole with the lines for force leaving it. Now move your hand in the direction indicated by the thumb. The current will flow as shown by the middle finger.

To compare this with the first illustration of paper and pencil, point the first finger upward and the thumb to the left. The middle finger will point to the top of the page.

But we have only been considering a straight wire, whereas the armature winding is in the form of a loop. As this revolves the opposite sides go different ways, relative to the lines of force. On one side they pass upward, on the other they pass downward, assuming the lines to be horizontal. But our rule still holds, for if the direction of the motion is reversed the direction of the current will be also. If the North pole is on the left of the observer and the armature turns clockwise (from left to right) the current will flow toward him on the right side. As the motion is in the opposite direction on the left side the current will flow away from him. As the current is produced on opposite sides in opposite directions the two join and flow as one. This passes to the commutator and is carried off by the brush, as already explained.

Cyanide Hardening

By David Baxter

FOR those who do not care to go to the expense of installing a hardening furnace the cyanide process of hardening the surface of small articles such as piston pins, roller bearings, keys, small cut gears, and valve stems, offers considerable opportunity for doing a good grade of work.

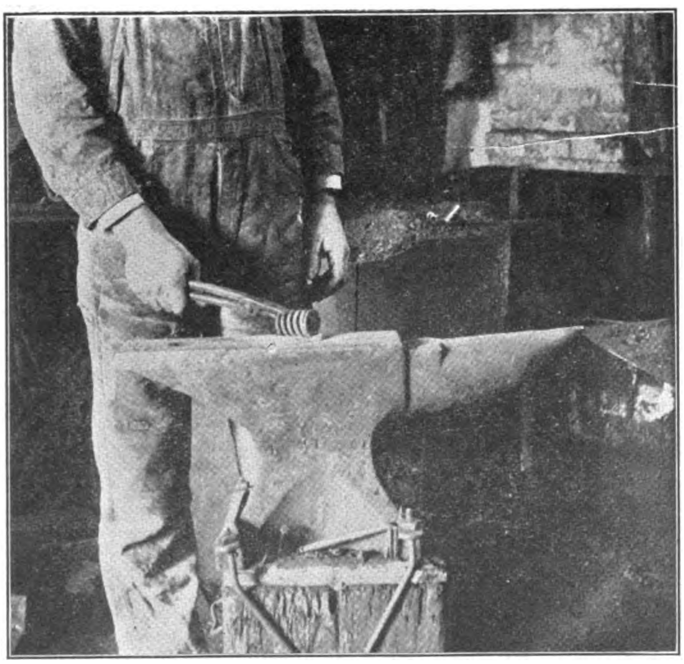

Fig. 1. Rub the Heated Spring in a Small Quantity of Cyanide Crystals

While furnace hardening is probably the best method, the cyanide process has several advantages. One of these is that it is simpler and requires less time. Another, that the equipment required is negligible; a cast iron pot or ladle being about all that is needed outside of the usual shop equipment.

There is no doubt that the mechanic who employs the cyanide process should have considerable technical or scientific knowledge in regards to degrees of heat, carbon content, angles of preheating, and so forth, if he intends to follow this work along strictly scientific lines; no one can deny that the possession of such knowledge would help him very materially. But how many garage mechanics, blacksmiths or machinists have the time to absorb all of the theories, formulae and other technical terms? Very few indeed; what they want is information stripped of all scientific verbiage. And that is what I am going to endeavor to do; I am going to try herein to tell you how to do cyanide hardening, as it applies to every day mechanics.

The best way to do this, I believe, is to take specific examples and put them through the details of the method, giving the how and why of each step in the proceedings. Then each individual will have an option of changing minor details to suit his own shop conditions. Remember there is nearly always some leeway in everything.

The cyanide process in its simplest form is illustrated in Fig. 1. Let us start with this and work up to the more complicated practices; or start with a mere superficial hardening and work up to jobs where the

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hardening penetration is to be deeper. The instance of a small coil spring as shown in the picture will serve to make this process quite clear. It might be well to state here, though, that the spring must be of steel as the process will not apply to brass. Also a spring can not be hardened too much or it will be so brittle that it will fly to pieces when put under a stress. The idea of hardening this spring is to make it stiff or more "springy," and only a very thin skin of the surface is hardened.

This is accomplished by first placing a spoonful or so of the cyanide crystals upon an anvil or other convenient location; then heating the spring to a dull red and rolling it in the cyanide. The crystals melt and commence to crawl over the surface of the spring. As this happens the spring is held up and turned over and over until it is entirely coated with the creeping cyanide. Then the spring is quenched or dipped in a tank of cylinder oil.

Another Example

Another example of this simple form of hardening is cited in the hardening of such articles as the end of a valve stem. The valve stem is heated red hot and the end is pressed down upon a cake of cyanide. When the cyanide melts and coats the end of the stem it is dipped in water or oil until cold. The cake of cyanide is made by melting the crystals and pouring them in a metal or clay mold.

To impart a few more degrees of hardness the article must be immersed in melted cyanide. This of course is not appliable to coil springs for the reason given above. This process is for small piston pins, roller bearings, set screws, etc., where a fairly hard wearing surface is desired. First, a small vessel such as a babbitt ladle, is nearly filled with cyanide crystals. This is then placed in the fire of a portable forge. Any other convenient heater will do, a gas flame or oil burner. The cyanide is heated slowly until it melts and settles in a pool in the bottom of the ladle. The heat is then increased until the molten cyanide is red hot; being careful not to raise the heat fast enough to burn a hole in the bottom of the ladle.

Speaking of the ladle: only a cast iron one should be used because a steel ladle will tend to draw the carbon out of the cyanide and thus weaken the effect of it upon the article to be hardened.

Hardening a Piston Pin

While the cyanide is melting and attaining the red stage of heat, the article to be hardened is also being heated, in the fire around the ladle. Let us say a small piston pin is to be hardened. This is placed in a clean part of the fire beneath the ladle. It is turned and rolled in the fire until it attains a bright red heat. Not sufficient to cause an oxide scale to form on the surface but considerably hotter than the molten cyanide. This should be ready by the time the piston pin is bright red in all parts. That is, the pin should be the same color all over; no dull spots mixed with brighter portions.

As soon as the cyanide and piston pin are ready the pin is quickly deposited in the molten bath of cyanide. The operator should be careful that the tongs are perfectly dry and that no moisture-soaked coals adhere to the piston pin as there is danger of an explosion if water comes in contact with melted cyanide.

The piston pin should be entirely submerged. It is

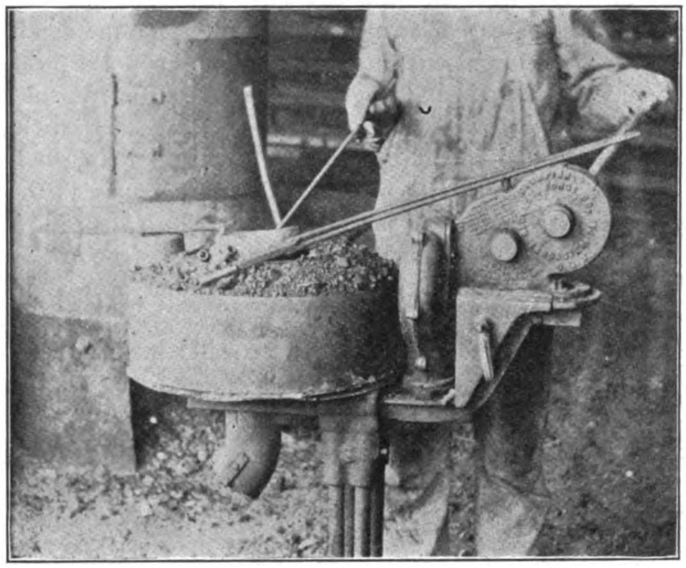

Fig. 2. Cyanide Hardening with a Babbitt Ladle

allowed to remain thus for from five to fifteen minutes, depending upon how much it is to be hardened. During this interval it is rolled over several times with a cast iron rod to be sure that the cyanide is evenly spread over the surface of the pin. That is, the pin is not allowed to rest the entire time upon the bottom of the ladle. This phase of the process is illustrated in Fig. 2.

After the pin has remained in the cyanide bath its allotted time it should be hard enough for ordinary purposes. But to intensify the hardness it is taken out of the cyanide and dipped in water or allowed to cool in oil the same as the coil spring. When quenching piston pins in water it sometimes happens that they are distorted by the extremely rapid contraction, particularly if the pin has not the same degree of heat all over. And, too, this distortion is aggravated by the way the pin is dipped. If the pin is dropped into the water flat the down side cools and contracts before the upper side, and as a result the pin is pulled crooked. To minimize the danger of distortion the pin should be dropped into the water endwise. If it is dropped straight and continues straight into the water the confraction will be uniform around the pin and will mount evenly as the pin passes into the water. But even this does not always produce a true pin, so it is better to have it a fraction over-size before immersing in the cyanide. It may be ground true after it is hardened.

A variation of this method of hardening, or perhaps it is a variation of the coil spring method, is to heat the article to be treated, hold it in the molten cyanide a few minutes, then reheat it and again immerse it in the cyanide. After this it is quenched in water or oil. Consider for instance, the valve stem: Get the cyanide

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in the ladle to a molten red stage. Heat the end of the valve stem red hot. Be sure it is clean and then lower the heated end into the cyanide bath. Hold it there a few minutes and then heat it bright red again, and again dip it into the cyanide. After a few minutes, plunge it into water. Strong salt brine is said to impart a harder surface than plain water.

The theory in all of these examples of cyanide hardening is that the carbon is absorbed by the steel, the depth of the hardening penetration depending upon the heat condition and upon the length of time the article is submerged in the cyanide. Literally speading the article must be heated enough to open its pores so the carbon can soak into them; then the article must remain in the cyanide long enough to permit the cyanide to soak in.

The idea of the quenching is to close the structure or grain of the metal very quickly. In other words, to close them tightly; thus causing a close-grained, hard surface. The sudden immersion in water imparts what is known as a chilling effect, or in the parlance of the foundry, a glass hard outer crust.

To increase the penetration the articles are suspended in the cyanide for half an hour or more. This is handily accomplished by hanging them on wire hooks from a cross rod above. Several different articles may be treated at one time in this way. However, they are not permitted to touch each other or to touch the sides or bottom of the cyanide pot. In this process, as when using the babbitt ladle, the cyanide pot should always be made of cast iron and should be heavy enough to retain t heat.

This pot is partly filled with cyanide crystals which are then melted over a slow fire. As soon as the cyanide settles into a molten red mass the suspended articles are lowered until they are entirely submerged. Then the fire is slowly increased until the cyanide boils. This

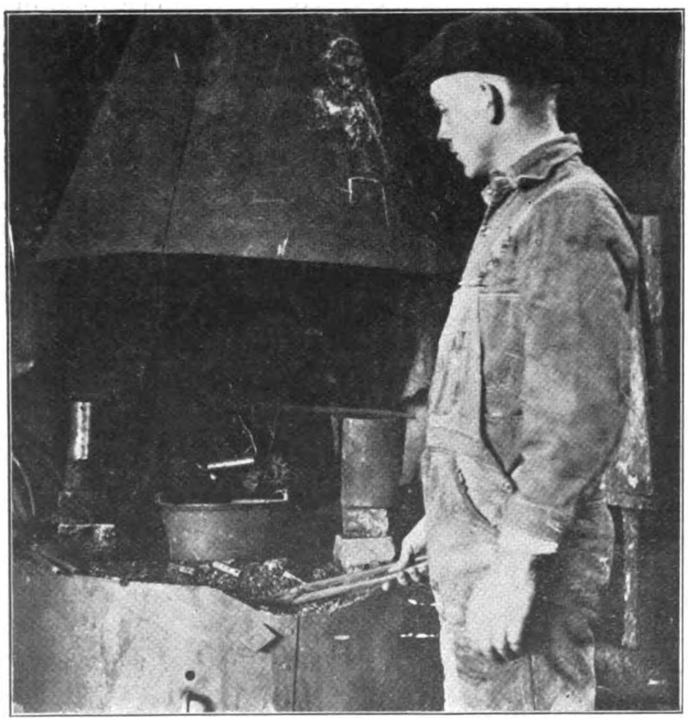

Fig. 3. Cyaniding Several Articles at One Time

Fig. 4. Quenching a Small Gear after Heating in Cyanide

boiling is similar to that of water boiling. The submerged articles are boiled in the cyanide the desired length of time, twenty, thirty, or forty minutes.

Then the articles are lifted out one at a time while they are still red hot and quickly dropped into the quenching tank or bucket, being careful about this part of the process as cautioned above lest the articles are warped by unequal contraction. Fig. 3 shows the articles suspended above the pot and Fig. 4 shows the act of quenching a treated gear.

After the hardened articles are all removed, the cyanide is allowed to remain in the pot until cold. Then, when necessary to use it again, it is merely placed over the fire and re-melted. One potful may be used several times before discarding. It is emptied when molten.

The mechanic should know that cyanide is deadly poison and that the fumes which arise from it while it is heating are poisonous. He should be careful about inhaling these fumes. In fact, it is best to have a hood or flue above the cyanide pot to catch the gas and carry it out of doors.

The mechanic should also be careful about handling the stuff, particularly if he has a cut or sore on his hands, or if his hands are moist.

If either of the cyanide processes are to be successful the mechanic should be sure to obtain a pure grade of cyanide as a weak or inferior brand will not produce the desired result. With good chemicals and careful attention to details a surface hardening can be applied that will add considerable to the wearing qualities of the article treated. Nor, as stated in the beginning of this discussion is it necessary to have heat measuring or testing instruments, or scientific formulae.

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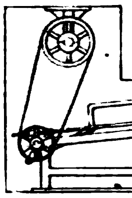
Bearing on Repairs on Bearings

Bearings the Subject of the Third Installment of the "Spring Cleaning Series"

By F. L. Almy



SINCE this article is a continuation of the one which we started two months ago, entitled "Spring Cleaning," we will consider, mainly, the repairs on main and crank-shaft bearings and, incidentally, the repairs on all other bearings on the car.

Without doubt the most important set of bearings in the whole car are bearings found at the "big end" of the connecting rods. Other bearings may wear loose and cause rattles and knocks but they seldom break suddenly or cause serious trouble until they have operated in this condition for some time. But let a connecting rod bearing break or wear loose and within a few minutes the rod is a menace to the engine.

Once a connecting rod has started to knock, there is but one sure remedy; stop the engine and have the machine towed to the repair shop or home. Some time ago when the writer of this article was financing (he uses this term advisedly because the balance was mostly on the wrong side of the ledger), a repair shop, a machine broke down within half a mile of the garage. The owner, not caring to telephone for a tow, decided to drive the car to the writer's shop.

After driving the car for less than a quarter of a mile, the broken connecting rod released itself from the crank-shaft, wedged itself between the crank pin and the cam shaft, and not only cracked the crank case but bent the cam shaft as well. Then the connecting rod and piston were driven up through the top of the cylinder block. Except for the timing gears and the carburetor, the engine was a complete failure. The wreck cost the owner nearly two hundred dollars; rather a high price to pay for a quarter mile drive.

Proper Equipment Essential

As a practical proposition for the car owner we would not suggest that he re-babbitt either main bearings or connecting rods unless he has the proper equipment. Only with the proper tools can one expect to replace the babbitt, once it has broken or melted from its place. If the car owner cares to purchase the proper tools, then, in the long run the equipment will usually pay for itself.

The equipment necessary for re-babbitting connecting rod bearings, consists of a re-babbitting jig, with harbors of the proper size, a melting ladle, soldering fluid, a bit of moulding sand or plaster and either a forge or a good hot fire.

The re-babbitting jig is a very simple tool, but should be accurately made or it will be worthless. It consists of a heavy, flat iron base, and two arbors mounted on it. One of the arbors is for the wrist pin end of the connecting rod, the other for the big end. Where the same jig is to be used for various sizes of rods, the arbors are provided with a number of sizes of sleeves. The greatest of care is used to mount the original, fixed

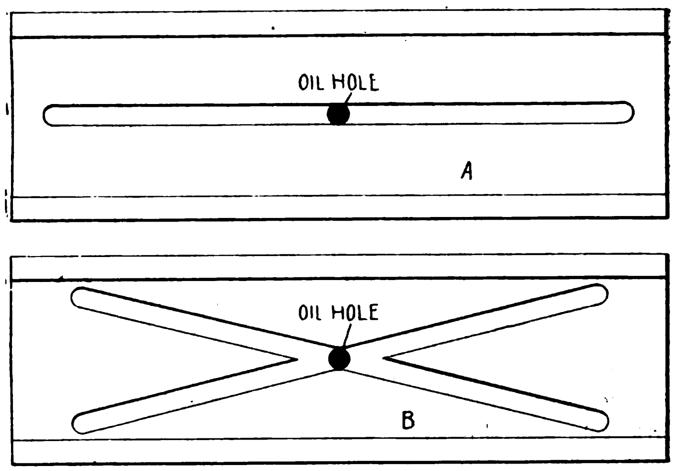


Fig. 1. Showing Two Methods of Cutting an Oil Distributing Groove in Connecting Rod and Main Bearings

arbors properly, so that they will be paralleled, for other wise the connecting rod will always be out of line.

We will assume that the car owner, or the repairman has decided to purchase a re-babbitting equipment. He may melt the babbitt metal either in a gas furnace, in a forge, or even in the house heating furnace, but if he melts it in the latter, he should cover the ladle with a piece of iron to prevent dirt from finding its way into the molten metal. In fact, it is a good idea to cover the ladle anyway, because this will keep grit out of the metal.

While the metal is melting, the connecting rod should be prepared. It is an easy matter to remove all of the old babbitt by placing the rod in the fire for a few minutes. If there is much metal it may pay to collect it in a ladle as it melts from the rod. Many repair men do not use the old metal a second time, because they claim that it contains dirt and grit which may damage the bearings, and because with each melting the proper proportions of tin, antimony and copper are changed by oxydization.

If one makes a point of discarding the old metal, and using only the best quality babbitt for replacement, then one is sure of a good bearing. One should never

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use the bearing metal for more than two re-meltings in any event because the saving does not justify itself. In a bearing replacement the cost of the metal is small compared with the value of the time required in fitting it properly.

After all of the old metal has been melted from the rod, the rod should be cleaned thoroughly at the point where the metal is to adhere. The easiest way to clean the surface is to dip the large end of the rod into a 50-50 solution of commercial muriatic (hydrochloric) acid and water. Allow the rod to stand in this solution for two or three minutes, then dip it into a strong solution of potash lye and water. Wash thoroughly, and polish the surface which is to be babbitted with sand-paper, or a file. The surface which is to be babbitted should then be coated with a non-corrosive soldering flux or fluid.

The threads in the screw-holes and the screws themselves should be oiled and the rod and cap assembled with at least a 1/8 inch shim at each side. The rod is now ready for the babbitt.

The re-babbitting jig should be covered with ordinary engine lubricating oil and the rod put into place upon it. The whole assembly should be heated to at least 300 degrees or the babbitt will be chilled upon contact with it. Do not heat the assembly to a red heat or the metal will be oxydized.

By this time the babbitt metal should be melted, if the fire has been hot enough, and the top will be covered with a thin skin of slag. Leaving the ladle still in the fire, with a flat piece of iron skim off the major portion of the slag which will probably contain considerable dirt. A new skin will form shortly but this will not matter, since it is only necessary to remove the excess dirt and oxide. The metal should be of the consistency of medium, or even light, lubricating oil, and should flow into the re-babbitting jig smoothly.

Cooling

The rod and jig should be allowed to cool of itself. Never under any circumstances pour water on the assembly to hasten the cooling, or strains will be set up in the metal, and there is a big chance that the rod or the babbitt will break while in use.

As soon as the rod has cooled sufficiently so that it may be handled, it may be removed from the jig. If one has a remmer of the correct size, the rod may be reamed to fit the crank pin. Such a tool may be too expensive for the average car owner, but a repair shop equipment is not complete without it. A connecting rod and main bearing reamer equipment saves countless hours of hand scraping, and fitting, and the resulting bearing surface is, in the writer's opinion, much better than the average hand-scraped surface.

Not having a bearing reamer the car owner must adopt the hand-scraping method. The rod is first marked and the same done to the cap, in order that the latter may be replaced on the former properly. The cap is then removed and the oil hole (if there is one in the cap) drilled through. With a sharp chisel, gouge out a channel across the face of the babbitt on a line with the crank pin center, and so that it will cross the oil hole. This channel should extend to within 1/8 of an inch of each side of the babbitt. The channel should be from 1/8 to 3-16 of an inch wide.

Advantages and Disadvantages

In figure 1 at A, is shown the shape of the channel mentioned in the preceding paragraph, while at B a second choice is given. Many repair men are in favor of the second "cross-cut" method, claiming that the distribution of oil is better, however, the writer feels that the method shown at A has one distinct advantage because more bearing surface is left. A 3-16 inch hole, a 3-16 inch wide groove about 1/8 of an inch deep at its deepest point, and constructed as shown at A, should fully distribute oil over the whole crank-pin surface.

If previous examination has shown that the connecting rod carries an oil tube for lubricating the wrist pin, then this whole should be opened through the top babbitt section, and a collecting channel, constructed as at A, and 1/8 of an inch wide, should be cut into the upper babbitt.

The rod and cap are now ready for fitting to the crank-pin. First carefully calibrate all of the crank-pins with the idea of finding whether or not they are perfectly round. If they are not round, then the crank shaft should be taken to a repair shop and the crank-pins trued up, because it is humanly impossible to fit a round bearing surface to an oval bearing.

If you have never scraped a bearing before, you will soon realize that you need plenty of time and still more patience. The job is not like piano playing, however, and you will probably become quite an adept before you have scraped in the whole set of bearings. The first thing to do is to coat the crank-pin with a very thin surface of prussian blue. Do not smear it on like butter, but spread it thinly and wipe it out with the finger until only a faint tinge of color remains.

Put the connecting rod, without the cap, into place against the crank-pin. At first, you will probably find that the babbitt metal is too wide to permit the bearing to touch the crank-pin. Trim off an equal amount of metal on both sides of the bearing until the babbitt touches the crank-pin. Press the bearing against the crank-pin, and rock it backward and forward a few times. Examination will then show the "high spots" which must be scraped off. When you have scraped off enough metal from the high spots so that the babbitt makes a reasonable contact, start on the cap and do the same thing until that, too, contacts fairly well with the bearing surface.

And now comes the tedious part of the work. Put the connecting rod in place, fully assembled with the cap clamped down tightly. Swing it backward and forward and remove it; scrape off the high spots and put it back again. Each time the rod is removed, distribute the blue over the crank-pin again. Do not make the mis-

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take of removing too much metal at a time, else the high-spots will be "low-spots," and you will be obliged to scrape the whole surface.

The man who can scrape a bearing so that there are no high or low spots has not yet been born. It is safe to say that, when approximately ¾ of the bearing contacts with the bearing surface, the babbitt is a "good fit." Obviously more attention should be paid to the upper bearing surface (that contained in the rod itself), should be fitted the best because it is this portion which carries the greatest load and the shock of the explosion.

If the bearing has been properly poured, and the hole is at right angles to the center line of the rod, then there will be no trouble in lining the rod up properly. Obviously the rod should stand at right angles to the crank-pin or it will not fit the cylinder properly, but will wear the side of that member A carpenter's square, placed along the lower, planed surface of the crank-case, will indicate whether or not the rod and piston are at right angles with the crank-shaft center.

The reader will notice that we have always referred to the removal of babbitt metal as a "scraping" job. We have said that a scraper should be used for the work. We mention this fact again lest the amateur should try to use a file or emery cloth or sand-paper for the work. If he uses any of these things he will damage the bearing and possibly the crank-pin, because, grit, emery or small pieces of metal other than babbitt may score the crank-pin while the engine is running.

Fitting Main Bearings

Re-babbitting main bearings is not a job for the car owner, and for this purpose, considerable equipment is necessary. As a matter of fact, the scraping, fitting and lining up of main bearings is a job for an experienced mechanic and the amateur who undertakes this work is wasting his time.

Because the job of pouring main bearings is so difficult and because it involves so much equipment we will not describe the operation in this article, but will take it up in an article by itself at a later date.

Assuming that the reader has a car in which the main bearings are poured into bronze backs and are removable, we will describe the method of fitting and lining up.

The actual fitting of main bearings, insofar as the scraping to a surface is concerned, is much the same as the work described in fitting in which this job differs from the latter task, that of lining up.

The term "lining up" means simply that the bearing centers are to be placed along the same center line. If we had but two bearings and a very short block, this work could be done easily with the crank-shaft itself as a center upon which to work, but with three or more bearings and a long crank-shaft, the latter unit cannot be used satisfactorily, unless it is extremely heavy in construction. There is always the chance that it will spring out of line because of the many bends or "throws" in its construction.

When fitting main bearings the tops of the bearings are first put into place, (if not already cast into the block) and a length of steel shaft used as a "liner." This steel shaft should be absolutely straight, and of a diameter equal to that of the crank-shaft journals.

For clarity, we will assume that this is a "three bearing job." Examination shows that the steel shaft rocks upon the center bearing, which means that the

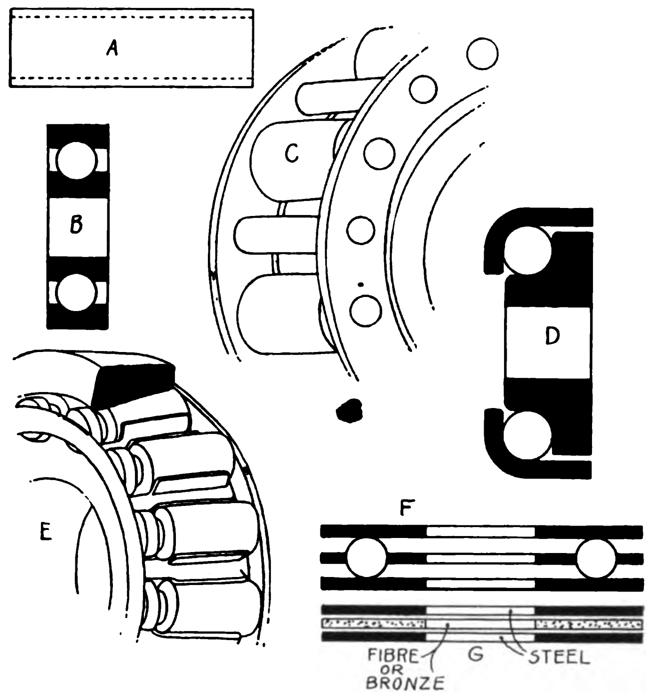

Fig. 2. Various Types of Bearings. A, Plain Bushing; B, Radial Ball; C, Radial Roller; D, Radial-Thrust Ball; E, Radial-Thrust Roller; F, Plain Ball Thrust; G, Plain Thrust

center bearing is higher than the ends. The center bearing surface must be scraped until the steel shaft rests upon all three bearings. Should it be found that the shaft rests upon the center bearing squarely and upon only the ends of the outside bearings, the high center bearing and the high ends must be scraped until approximately the whole of all of the bearings carry the shaft. The caps are then put into place and lined up in the same way.

Only after all of the bearings are properly lined up may the crank-shaft itself be put into place and the bearings scraped to fit the journals.

At this point we might mention the fact that main bearing reamers and lining up tools are purchasable on the market and should be a part of every garage equipment.

Cam-shaft bearings and many other bearings at various parts of the machine are of the "bushing" type; solid tubes of metal and this type of bearing may be fitted, satisfactorily, only in one way, by reaming. If but a small amount of metal is to be removed, an expert may use a file for the purpose, but the file should be perfectly clean, and should not have been used for any other purpose. Emery cloth and sand-paper should never be used for bearing surfaces.

In addition to the two classes of bearings which we have mentioned, namely, babbitt and "bushing" type,

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there are three others commonly found in automobiles; ball, roller and thrust. The latter class, or thrust bearings, may be ball, roller or plain metal or fibre washers.

Ball bearings, and in this class we will consider only those ball bearings which carry a load radially and possibly a proportion of the thrust consists of three parts; the center cone or race, the balls and the outer cone or race. In the plain ball bearing there is no opportunity for adjustment. Either the bearing is in good condition or it is worn and therefore in poor condition. Where an examination shows that the bearing is worn, the bearing should be replaced with a new one. By the term "new one" we mean a bearing which is in good condition and not especially one from the factory. There are a few firms which make a specialty of repairing ball bearings and such bearings, when properly repaired, are practically "new."

Roller bearings of the radial type, have no adjustment, and are to be treated in the same way as ball bearings. The question has often been asked; "why cannot I put a thin sheet of metal between the outer race and the housing and so compress the outer race until the lost motion is compensated?" To this we can say that such a repair may be made in some cases where it is necessary, but the job is unsatisfactory.

Ball or roller bearings of the thrust type may be repaired and adjusted. An examination will soon show if the races are worn or the rollers broken. The repairs may be replaced if the proper care is used and the best of the bearing used.

Plain thrust bearings usually wear at one point only, the thrust plates. If balls or rollers are used, then the raceway is worn through the case-hardened surface. Where such is the case new races should be installed in every case.

In adjusting ball or roller bearings one should allow a small amount of play in the bearing or it will be destroyed. The average mechanic will say that the amount of play should be just enough to "feel," and no more. Perhaps this is the best way to describe the adjustment.

In the next issue we will consider other general items which come under the head of "engine repairs" in the overhauling series.

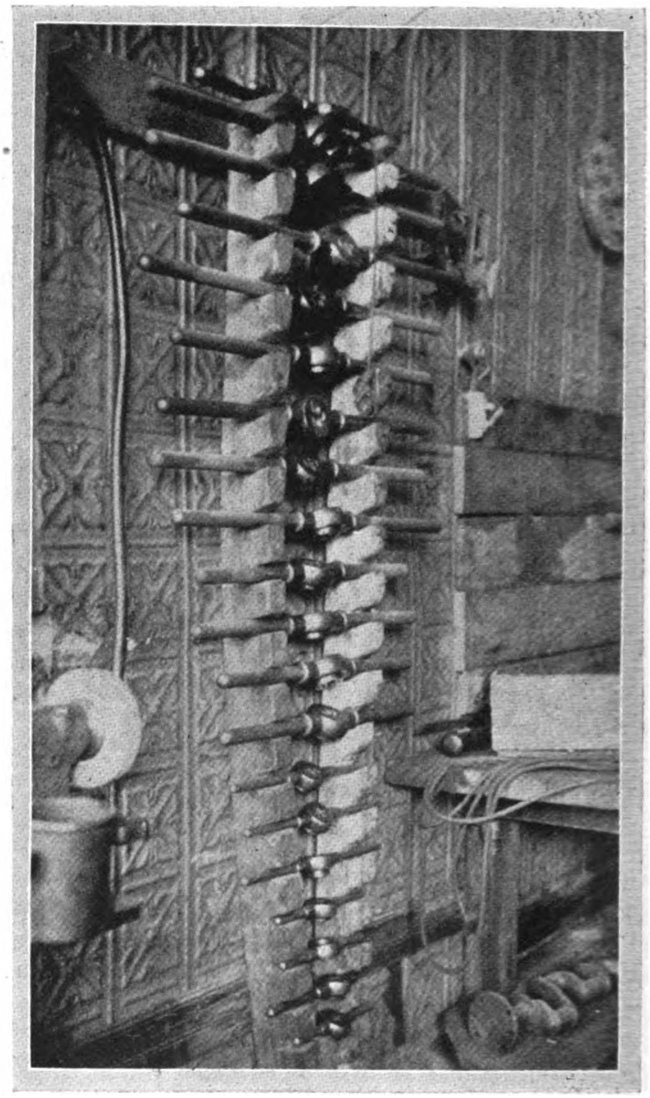
A round file held in a carpenter's brace and turned like a bit will enlarge a hole faster than when used in the conventional manner, at the same time keeping the hole almost perfectly round.

Look things squarely in the face. Find out what is wrong with your store, your service, your advertising, your merchandise, or yourself. If business is poor with you, some or all of these things are wrong. Get them right.

CONVENIENT RACKS FOR DIES

By Dale R. Van Horn

It is a bother to keep dies in their proper places in the boxes in which they come, if they are used frequent-



Die Rack

ly. One shop foreman simplified the matter considerably for himself by making a rack for them from two by fours as shown in the photo.

Two "two by fours," nailed against the wall, set at an angle to adapt themselves to the varying sizes of the dies, with notches cut in them, complete this rack.

SPIRAL SPRINGS

By R. L. Prindle

Spiral springs are obtainable in such assortment that one is rarely compelled to make one through loss of an odd size. One should bear in mind, should the occasion arise, the hand drill fixed in a vise will serve as a perfect winder of small springs, using a piece of round steel rod as a mandril.

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Experience Exchange

A Department Which Readers Find Helpful; Have You a Useful Suggestion to Send In?

A BUICK TIP

In the January issue of our magazine we published the following inquiry and reply:

Fires Unevenly When Running

From E. J. Mock, West Virginia: I have a 1914 Buick Roadster, Model 24, which operates satisfactorily under certain conditions but not under others. When idling, the engine will run on all four cylinders without a single missfire, regardless of whether it is warm or cold. As soon as the car is started, however, the cylinders begin to work unevenly.

While the car is running at a fair rate of speed, usually but three cylinders fire. At times, though, all four will operate for perhaps a distance of half a mile, then the trouble commences again. I have installed a new carburetor, put in new piston rings, ground the valves and adjusted the valve clearances. I am sure that the plugs do not cause the trouble. Can you give me any assistance?

Reply: The mere fact that the engine operates smoothly, always, when the car is standing would indicate that it is either the flexing of the frame or its parts, when the car is in motion, or the air friction which causes your trouble.

We are inclined to think that the rapid rush of air against the carburetor air valve is causing the trouble. Possibly the air blows into the carburetor and causes a lean mixture or possibly the passing of the air by the air intake tends to draw the air from that unit.

We should advise you first to eliminate any possibility for this trouble by placing a wind shield, made from tin or sheet iron, in front of the carburetor. Make this shield large enough to protect the carburetor and manifold.

Oftentimes ignition wires pass through small holes in the sheet metal of the chassis. Under ordinary conditions the insulation tends to protect the wire, even after small portions of the insulating material has been worn off. But, with the movement of the body parts, contacts and ground are formed, resulting in short-circuits and a consequent uneven engine action.

The swaying of secondary wires against metal parts, or the swaying of metal parts against the secondary wires, will often cause trouble such as you describe. Remove the hood and try the car on the road and see how the engine acts.

Mr. Donald Hampson who contributes to our magazine regularly writes to us as follows:

"I had the same thing happen to me with the same model. Just once. When given the screw driver-spark plug test on the floor, everything worked according to Hoyle and the cylinder cut out beautifully, but when I got out and tried to pull a little grade, I had to drop to second every time. Well, I did all the usual things—wires and carburetor and leaks and plugs—and all to no avail. I mentioned it to a friend one day who was 'on his third Buick' and all he did between spasms of laughter was to tell me to 'turn the cage around.'

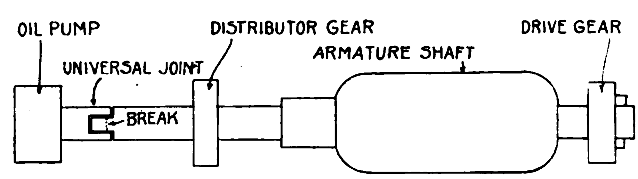
"Sure enough, the bonnet over the cage unscrewed easily and the carbon marks on the cage when removed showed that it *had worked itself around* until there was hardly an eighth of an inch opening left. You know there is a one and one-half inch round opening in the side of the cage that is supposed to be placed in line with an opening like it in the cylinder walls. In my case, it was an inlet valve and I didn't get gas enough to do any work at all, though when the engine was idling it was reasonably sufficient. Unless the bonnets on Buicks are set up extremely tight the cages do work loose—and sometimes they turn around."

We publish this since it will probably be of help to many who have the same trouble. It may be that this little kink is entirely new to a great many Buick owners. We are republishing both the inquiry and the reply so that our readers may fully understand the entire matter.

REPAIRING A BROKEN ARMATURE SHAFT

By G. K. Watson, Mississippi

The armature shaft on a Chalmers Six was broken and it was a case of welding a piece on the end of the shaft or securing a new armature shaft. A new armature



How the Repair is Made

would cost $18.50, while the old armature was good but for the break and gave the required amount of current. I had about two inches welded on the end, assembled the generator, distributor, and oil pump, measured and cut the armature shaft, so that the shoulders fit the universal joint. I then put everything together again and the car is running satisfactorily.

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Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

Good Roads and Automobile Registration Fees

THERE seems to be growing a popular belief that the cost of good roads and road improvements should be assumed by the owners of automobiles and motor vehicles. The public at large, or at least that portion of this class which does not own automobiles or trucks has been trying for the past few years to shift the responsibility of government, or rather the cost of government, to the shoulders of vehicle owners.

This condition was first noticeable at the time when the so called "luxury tax" was being debated. As the reader will probably recall, at that time it was considered seriously to tax the automobile high enough to make up any deficit in the national treasury. It was only by dint of much effort on the part of friendly legislators that the measure did not become a law. We find that the poison is still in our system and that it is breaking out in the form mentioned in our first paragraph; the idea that the automobile must bear the cost of road improvement.

Just why people can be so narrow minded as to feel that the roads are for automotive traffic only is a question that cannot be answered. Trace the civilization of any community, of any state or any country and you will find that the advance has been proportionate with the advance of transportation.

A town cut off from its neighbors by poor roads and poor rail facilities is invariably doomed to stagnation. Improve the roads or grant a franchise to a live railroad and that town comes to life. Good roads improve the town as a whole. And it follows that, with the improvement of the town, the citizens in it, whether they be stockholders in the railroad or automobile owners, profit by the general improvement.

Let us consider for a moment the state of Connecticut which a few years ago was noted for its "abandoned farms" as many properties were called. Men bought up land far away from railroad facilities because it was cheap. They existed for a while, perhaps with an abundance of farm products, but without being able to obtain, easily, other necessities of life. After a time they abandoned the property simply because of the difficulty in marketing their products and in obtaining many things which they needed for comfort.

With the improvement of Connecticut's roads the number of abandoned farms has diminished. Farmers living far from rail communication have communicated with towns and cities by means of automobiles and trucks; their fortunes have thrived and in many ways they are in a better situation than their city neighbors.

Obviously the State has been improved and the amount of taxes increased. Is it not logical to assume that a part of the money received in taxes should be diverted to improving the roads?

We doubt if any modern piece of machinery is of such general public value as the automobile. This machine has long since passed from the "luxury" class into that of "necessity." The automobile is as necessary to modern civilization as windows in houses. Considering the machine in this light it is as ridiculous to tax the automobile to an excess as it is to levy real estate taxes upon the windows in a house.

As a necessity the automobile will withstand a much higher tax rate than it is now paying. But will this not result in putting the machine into the "luxury" class? We claim that it will.

A fair and just tax on automobiles is something every owner willingly pays but when the public tries to make the automobile owner pay for all roads, then the taxes cease to be just.

Just a Suggestion

FROM time to time we receive letters from our readers asking for advice concerning schools and textbooks; asking how they may learn, in the easiest and most thorough way, the automobile repair game. Many of these readers have money to invest and desire to take up correspondence courses.

We will not enter into a discussion as to the merits of a correspondence course but will offer a suggestion. We advise our friends to obtain practical experience. If they cannot attend an automobile school and decide to take up a correspondence course they should purchase a cheap car, get their practical experience working on it. It is possible, even in these days of high prices to obtain a "junked" car at less than fifty dollars. As an automobile the thing may not be a success but if the amateur will spend his spare time working upon it it will afford much amusement and give the purchaser much practical education.

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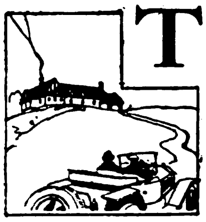
Resurrecting An Automobile

Part Five

By James F. Hobart



The second tire which Mr. Smith tried to inflate with the power or engine pump, proved a *sticker* and he was unable to get any pressure at all in the tire and could only work up 55 pounds upon the gage in the pump tube. "I'll see about that" said Mr. Smith, so he took the pump off its anchorage upon the water pump housing. He found the pump fastened by two one-half-inch cap screws with places for two dowels. One of the pins was on the job but the other was missing. There was nothing but the resistance of the two cap screws to hold the pump-gears accurately in alignment. When one of the two screws happens to get a bit loose, the thrust of the gears threw the gears out of mesh a bit and a great grinding noise was heard.

A Hand-Made Dowel

Mr. Smith lost no time in inserting a dowel in the vacant place. He hunted up a wire spike which would almost go into the dowel-hole in the bracket, then he filed the end of the spike until it could be driven very tightly into the hole in the bracket which was about one-half inch thick. But Simon filed an inch of the spike and made an extra good fit of the second half inch thereof. Then he carefully filed a half-inch of the spike at its very end, to slide snugly in the hole in the pump base.

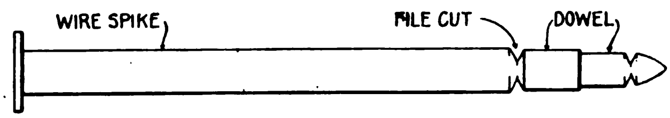
By working thus, Mr. Smith took advantage of having the length of spike for holding the little dowel while working it out and so he was also able to make a fit in both bracket and base before cutting off the proper length of dowel, after which it was driven into place in the bracket and so well had he done the work of fitting, that the dowel needed only to be "touched-up" a bit at its top end.

The engraving shows the manner of making the dowel by hand. The file cuts were made deep enough that the dowel could be easily broken off after completion. The tip of the spike was broken off at once but the dowel was not broken off until Mr. Smith was pretty sure of a good fit as described above, in both bracket and pump-base. To hold the spike while it was being filed, he made a deep file-cut in the edge of a bit of board. With the edge of board fair with the edge of the bench, the spike was laid in the cut and revolved by the left hand while the file was handled by the right. In this manner, Mr. Smith did some pretty good lathe work with only a file.

Taking Down The Pump

Mr. Smith took the pump all apart. It was a two-cylinder affair with a ball valve on top of each cylinder and an oil separator cylinder adjacent to the pump cylinders. The rubber could be attached to the upper part of the air chamber, at the lower end of which was a plug which had to be removed occasionally to let out the oil which had been caught by the separator and thus prevented from going into the tire.

The screw plugs in top of cylinders were stuck so fast that they had to be heated a bit before they could be unscrewed. They were well treated with graphite before the plugs were replaced. Each plug was hollow and a coiled spring protruding from each plug, bore against the ball valve immediately underneath each plug. Both the balls and the springs were covered with caked-on grease and dirt, making the balls almost inoperative as valves. A thorough cleaning cured this part of Mr. Smith's troubles.



Hand Made Dowel

Trouble In The Air Tube

The cylinders and the pistons of the pump were found in good condition and were replaced after cleaning, oiling and being fed with graphite. But the air tube, and there was about sixteen feet of it with a gage inserted therein near one end of the tube, was clogged so tightly that Mr. Smith could not blow through it.

Mr. Smith pushed a wire into the tube as far as the wire, a No. 8, could be made to go. Then he tried from the other end of the tube but could not push the wire clear through. There seemed to be no obstruction in the tube but the oil evidently had softened the interior coating of the tube, the coating had swollen and closed the passage nearly tight. But the wire could not be pushed clear through the tube, neither could a smaller wire, so Mr. Smith cut the tube and was then able to work the large wire through each piece, from either end and after pulling the wire through and back and forth several times, the tube was opened to a degree.

The tube was spliced by inserting a bit of copper tube and binding the ends thereupon with copper wire. It was found that air passed through the tube after thus cleaning it, but Mr. Smith measured up the tube length and found that he had better order at once about sixteen feet so as to be ready for emergencies whenever the

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old tube should close up again—as it surely would under action of the oil and pressure from the pump.

The Pump Safety Valve

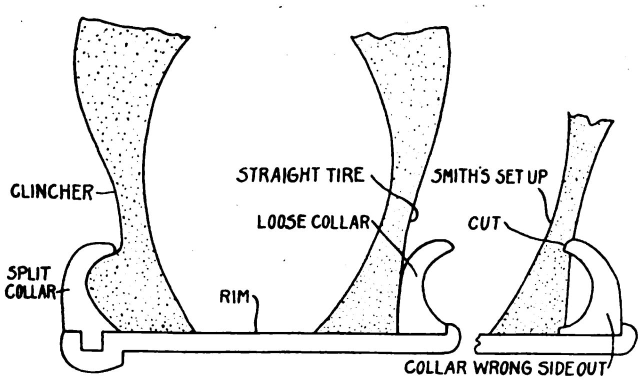
A little safety valve on top of the pump was supposed to prevent overpumping a tire. Remembering the first tire pumped which went so high that it was "two inches off the floor" Simon dug into the little safety valve and found therein a plain brass plug with a bit of wire spike behind it, and screwed tight down upon the safety valve opening. "Mighty little safety about that" said Mr. Smith as he cleaned the valve and seat. Later, when taking down the engine oil-pan, he found imbedded in the grease thereupon, the spring and follower which belonged in the safety valve.

Formerly, the air tube was applied with its attached valve nearest the tire pump and Mr. Smith found that he had to get 100 pounds pressure on the gage to show 80 pounds in the wheel by the tire-gage. Then the tube was reversed and the gage put next to the wheel. Thus, 90 pounds on the air-tube gage would show 80 pounds in the wheel by the pocket gage. Mr. Smith decided to buy a new tube for he did not care to pay for gasoline to pump air through a sticky tube in which a whole lot of the pressure is absorbed in skin friction inside of a tiny rubber tube.

Straight and Clincher Tires

There was a little plank incline in front of Mr. Simon Smith's garage and the very enterprising (?) Florida Cracker who built the incline had placed 2-inch by 4-inch scantling exactly far enough apart so that the wheels passed directly above the timbers in question. As the runway became old, the spikes began to work loose in the boards and the timbers. One day, while driving the car into the garage, something almost stopped the car and then let go with a jerk.

The first time he passed the left rear wheel, Mr. Smith noticed a fresh tear in the shoe. The outer layer of rubber and the first of fabric had been torn up by a spike-head which still protruded an inch above the floor



The Wrong and Right Way

of the runway! Mr. Smith lost no time in putting the torn shoe on behind the car as a "spare" while he also ripped out the plank runway and put in a spikeless affair made from a sack of cement, some sand and broken limestone.

The first time Mr. Smith passed a tire-shop he left the torn tire and the shopman did not seem to enthuse very much about repairing same. He wanted to see the inside of the shoe before he would say he would repair it or not. The rim was trundled into the tire-shop and to deflate it, the workman inserted a key, pushed the valve back, gave the key a slight twist which held it in place with the valve open.

Take out the valve and it will deflate quicker" said Mr. Smith as the tire man grumbled something about its "taking all day to deflate one of these big tires!"

"I know that" said the workman, "but you most always have to put in a new valve when you remove one and I don't like to have to charge you with a new valve when there is no need of it." Finally the air went down enough to allow the split collar to be loosened from the front edge of the rim.

"Say!" said the tire man as he lifted off the loose collar:—Here you have the clincher side of the collar holding a straight side tire! It's a wonder the tire hasn't been spoiled. See how the collar has cut into it! How'd you ever come to set up a tire that way?"

"The tire is just the way it came when I bought the car" said Mr. Smith, "Now, just what is the matter?"

"It's this way," said the tire man. "One side of these collars or rings is made for clincher tires, the other side for straight tires and you turn the collars that side in, which will fit the tire to be used. Here it is —(as shown in the cut)
—A section of the ring or collar is about as shown here, the 'Clincher' tire being shown on the left and the straight side tire on the right."

"That split collar" said the tire man, "can be turned the other side out when a straight side tire is to be used, therefore these collars can be used for either style of tire. On the right, the loose collar is shown arranged for a straight tire. Just slip this collar or ring off the rim and replace it with the other side inward and it will be all ready for a 'clincher' tire. The split collar, as you may see, also reversed; the tongue which engages the rim being located exactly in the middle of the collar so it will fit the rim, no matter which side out the collar may be used."

The Incorrect Way

"Now, here is the manner in which this tire was mounted," said the tire man. "You see the straight side of your tire (shown by the sketch) with the clincher side of a collar bearing against it. Note how the air pressure is forcing the sharp corner of the collar into the rim? Note the collar wrong side out and the corner already beginning to cut into the tire? It is only a matter of time before the tire is cut in two!

Here is a tire on the other side of your car, Mr. Smith, which has a straight side tire set up properly. See how the groove for the clincher shows outside? You had better go over all the wheels of your car, take down each tire, clean out the inside of the casing, dust it with chalk or talc powder, see that the flaps or protecting strips are whole, then set up the tires again with the

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collars right side out according to whether the tires are straight or clincher."

"You won't catch me that way again," said Mr. Smith. "Now, how about that tire? Can you mend it?"

"I'll see in a minute" said the tire man and he thrust a bit of tubing against the projecting air-tube of the tire. The tube was just large enough to slip over the thread where the cap screws upon the tube, yet small enough to pass readily through the hole in the steel wheel-rim. With this bit of tube, the tire man pushed the air-tube down until its end was past the steel rim, then he readily lifted the tire squarely off the rim, and the tire came off easily.

"Say" ejaculated Mr. Smith:—"that sure is a whole lot easier than trying to pull over the rim on the side of the tire opposite the air-tube, isn't it? Bet I will have a bit of ⅛-inch gas pipe before I take down a tire again! How about that tire? Can you fix it up?"

"Sure! The shoe is all right inside and not half as bad as it looks on the outside. You can have it the day after tomorrow. But just watch out for those straight and clincher tires after this."

Oil and Leaks

Mr. Smith took the side of an old box for a "creeper" and went under the car with oil-can and grease-gun. He filled 34 screw grease cups, injected four quarts of oil in the rear axle housing, put one quart—all "600-W" in the change gear box and then tried to find out how much to put into the engine case. The instruction book told him that the oil in the four wells should be just high enough so that it would be touched by the little paddle on lower end of each connecting rod cap. Simon says he is still studying how to tell when the little paddles will reach the oil and he further says the only way he can see for sure is to take down the engine or at least, remove the lower portion of the engine case and look inside. He did remove the little cap on the left side of engine and found a wire-screened opening nearly two inches wide by three inches long.

He thrust a stick down into the bottom of one of the "wells"—there is one for each crank—and found about one inch of pretty good looking oil in the bottom of that well, also in an adjacent one which he managed to sound. But no oil would flow out of the engine crank-case drain hole, so Mr. Smith put one quart of good cylinder oil into the case and closed the screened opening. When he started the motor, a stream of black smoke, the full size of the exhaust pipe, rolled out from behind the car and that smoke stayed right on the job for 100 miles or more.

Apparently after that quart of oil had been burned out of the cylinders, the smoking stopped. There is a power oil-pump on this Cadillac which forces three or four drops of oil per minute somewhere into the engine after first having sent the oil through a sight feed on the cowl board. But Mr. Smith is still guessing as to how much oil should be carried in the bottom of the crank case.

Editor's Note.—This is the fifth article of a series by Mr. Hobart about the home care and repair of a car. The sixth, which will be about a weak storage battery and a loose front wheel, will appear in the next issue.

Dismounting Ford Repair Jobs

One Who Is Experienced Explains Speed Methods for Accomplishing Various Operations

By John G. Whyte

THE greater number of Ford Repair Shops figure their repair jobs at a flat rate for labor rather than a stated amount per hour for each mechanic's time. It is therefore necessary to bring these operations down to a system whereby each mechanic understands exactly how to dismount and reassemble, doing the work well and at the same time reducing the labor to a minimum of time.

For instance, if the shop receives five dollars for a "Valve and Carbon" job, there would be little profit in it if the Mechanic is allowed to spend three hours over the job. The operation can be done thoroughly in one and one-half hours. A motor and transmission complete can be taken out of the frame, (leaving the crank case in) in one hour with a mechanic and helper. A Motor can be thoroughly refitted, burnt in, new pistons fitted and replaced in the frame ready to go out in one day. The transmission cover can be removed, new bands placed in and the cover reset in one hour with a mechanic and helper. If the self starter type, it will require an additional half hour owing to the removal and replacement of the starter and bendix drive.

If the car is properly jacked up, a front spring can be mounted in one half hour. A rear end complete can be taken out of the chassis in twenty minutes, disassembled in one half hour and rebuilt in two hours more. An able Ford mechanic will do three rears per day without effort and two helpers will mount them under the cars, if they understand the exact operations.

Knowing what to do first, what to disassemble and what to leave is half of the repair business. Hours can be saved by careful consideration of ways and means of

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handling the operation at hand. The following article deals with dismounting the Motor and transmission. I have endeavored to lay it out in detail exactly as it is done in the average Ford Shop.

MOTOR: Shop time with helper, 1 hour.

Place water pail under Radiator, open drain cock and allow radiator to drain.

While Radiator is draining, block up the car under the running boards. Use horses or heavy blocks.

Remove rear spring shackles allowing the wheels to rest on the floor.

Disconnect the brake rods at the front clevis pins under the emergency hand lever.

Remove the 3/8 inch cap screws which hold the Universal ball cap.

Slide the rear back until the ball cap and universal tongue are free from the transmission case.

Remove the 3/8 inch nuts which hold the Radiator shell to the frame.

Remove the 7-16 inch cap screws which clamp the water outlet connection to the cylinder head. (At the top)

Remove the 7-16 inch cap screws which clamp the water inlet connection to the motor block. (At the side)

Unscrew the radiator support rod from the radiator. (Turn to left)

Remove radiator.

Slack off the 3/8 inch cap screw which adjusts the fan.

Remove the 5/8 inch cap screw which clamps the fan bracket to the timing gear case.

Remove fan complete.

Disconnect wires from the Spark plugs. Leave these wires on the coil box. Fold them up out of the way.

Slack off the 3/8 inch cap screw which clamps the commutator to the timing gear case.

Remove the commutator complete leaving the wires on. Fold away to the side out of the way. Do not disconnect the timer wires at the dash. On re-assembling everything will then be ready.

Remove the spark plugs.

Remove the 7-16 inch cap screws which clamp down the cylinder head.

Remove the cylinder head. Do not try to save the gasket as it is not policy to use the gasket after it has once been compressed.

Disconnect the exhaust pipe at the packing nut under the dash.

Pull the exhaust pipe out of the muffler and let it lay out of the way.

Shut off the gasoline at the tank connection. (Sediment bulb)

Remove the intake manifold and carburetor complete.

Remove the exhaust manifold. Do not try to save the gaskets as it is best to insert new ones. Old ones cause air and exhaust leak.

Helper now gets underneath the car and holds the 3/8 inch cap screws which fasten the transmission cover to the crank case.

While the helper holds each cap screw, speed off the nuts with a 3/8 inch crank wrench. Helper pulls out each cap screw as removed.

Later Models

If 1919, 1920 or 1921 model with self starter, remove the cup at the read of the bendix shaft, remove the rear 5-16 inch cap screw which supports the bendix spring and slide out the bendix.

Disconnect the self starter at the front of the transmission case by removeing the four 5-16 inch stove bolts which support the starter.

Drop the left side motor pan and remove the self starter from the bottom.

Remove the megneto wire from the magneto contact point on the top of the transmission case and fold away.

Pull suddenly on the transmission pedals so the gaskets break away and the transmission cover can be lifted off complete. Do not try to save the gaskets. New ones are always used.

Revolve the flywheel so that two of the three triple gears back of the flywheel are at the top.

Turn the transmission bands around so the lugs are at the bottom of the crank case and they can be lifted out easily without catching or bending.

With helper underneath again, remove the 3/8 inch cap screws all around the motor as on the Transmission cover. The motor dust pans will release with these cap screws and can be bent down out of the way.

If no hoist is available, sling a light rope under the spring at the rear of the transmission. One man stands on the frame and lifts the rear of the motor enabling the helper to get his hands under the motor block at the front.

When lifting be careful not to allow the Field Coil in front of the flywheel to rub on the crank case. The insulation will be destroyed ruining the field coil.

Slide the motor ahead and lift out of the frame on to whatever stand there is to receive it. Do not let it rest on the field coil.

At the rear of the flywheel there are four 1/2 inch cap screws tied with wire. Remove these and the entire transmission and flywheel can be dismounted from the motor.

To remove the field coil, remove the four 3/8 inch cap screws on the inner rim of the coil. They are tied with wire. Be careful in removeing not to bend or break the oil pipe which passes through the field coil. Slide the pipe out to the rear.

End of Operation

If necessary to remove the timing gears do not remove the half time gear from the camshaft unless you mark its position. It is possible to get it one half turn out of time.

In re-assembling, see that the letter "O" on the crankshaft gear and the word "Ford" on the half time gear, meet.

Two 3/8 inch set screws hold the cam shaft in position. They are on the right side of the Motor. On early model cars the push rods are drilled all the way through and it is possible to lift them and insert cotter-pins in order to allow the cam shaft to be taken out easily. Otherwise the

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push-rods would interfere with the cams on removeing the cam-shaft. In later models it is best to remove the valves and valve springs.

In the earlier models, spur gears were used on the timing gears. By means of a Ford gear puller these may be replaced with the new style helical gears which are more silent.

When there is "end play" in the crank-shaft it can be remedied by scraping in a new rear main bearing cap. This cap is important as it bears the entire weight of the flywheel and most of the weight of the transmission. Most motor knocks are caused by a loose rear main bearing cap on this make of motor.

Connecting rods are tightened by facing off on the lower cap of the bearing. They should not be taken up too tight. When right it is possible to move them slightly to right and left with a tap of a light hammer.

A connecting rod or main bearing which seems too snug can often be "set" by pounding on the cap with a light hammer.

Connecting rod and main bearing cap screws should be VERY TIGHT and well cotter pinned to prevent their getting loose with the vibration of the Motor.

* * * *

Cam-shaft bushings when worn can not be tightened but should be replaced with new ones. The cam-shaft seldom shows any great wear and the bushings generally fit without reaming out.

When pistons show signs of "scoring" or burns they should be renewed. If the cylinder walls are slightly scored this can be remedied by "lapping in" with an old piston and then a new one fitted.

A Motor a year or more old will usually take an oversize piston. If there has been trouble with oil leaks in the pistons and fouled plugs, oversize pistons will usually remedy this.

Three oversizes are furnished, .0015, .0025 and .0031.

If the cylinder walls are so much worn that .0031 will not fit then it is advisable to rebore the job and have new pistons made or mount a new block. It is almost as economical to mount the new block and sometimes more satisfactory.

Wrist-pin bushings can easily be pressed in with a vise. They should be carefully reamed out to fit the wrist pin and should be fairly snug. It is not policy to put new wrist pins in old bushings as the bushings have a tendency to wear one sided and the fit is only temporary.

Piston rings should be fitted to the cylinder walls before placing on the piston. The gap between the ends should be about the thickness of two pieces of writing paper in order to allow for expansion. Rings must move freely in the grooves on the piston and should be spaced so that there are no two openings together.

When there has been trouble with oil leaks, one leak proof ring of a reliable make, placed in the top center groove will remedy this.

* * * *

Valves should be carefully ground using a coarse compound first and then polishing with a fine compound. The valve stems should set close to the push rods else there will be a valve tap and the valve will not open sufficiently.

Intake valves should be spaced about three thousandths of an inch or about the thickness of a piece of writing paper. Exhaust valves should be about five thousandths or the thickness of a double paper. Exhaust valves have more expansion than intakes.

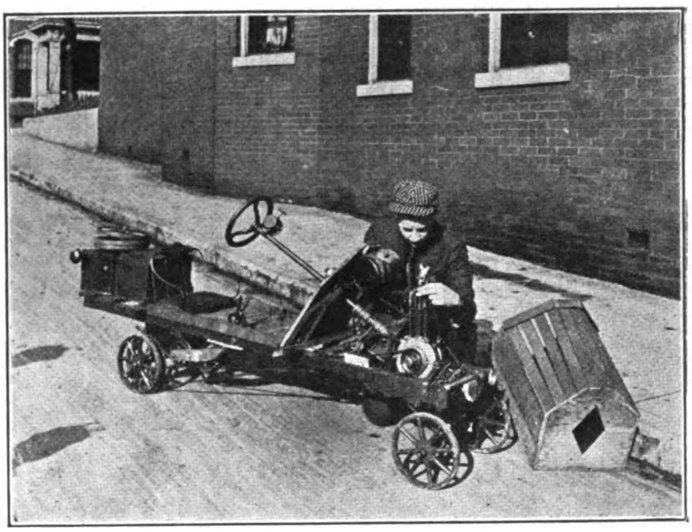
If valves have pounded so that they are too short in the stem it is best to replace them with new valves. If the valve stem is too long it can be filed. After grinding inspect again as the grinding allows the valve to set a little.

When the valve seats on the cylinder block are worn it is best to ream them. There is a special Ford reamer for this purpose.

If there is side play at the point where the valve passes through the valve guide in the cylinder block it is well to insert new valves. The guides seldom wear but the valves wear considerably.

THE NEW 1921 MODEL

It is quite possible that the vehicle pictured below is not the most pretentious in the World. It may also be that it is not the most comfortable. It is very



(C) Keystone View Company.
Not Quite a Limousine

probable that it has never broken any records for speed, and that its accessories are not the most modern. However, all this may be true of your own car.

There is very little doubt though that Cleage Field, who built this machine, gets more pleasure out of it than you do out of yours.

Not only did he make this machine, but he also designed it while it has not exactly a stream line body, yet it goes and that is about all that Master Field wants.

The young gentleman has kindly removed the hood from his machine so that one can more readily see the mechanism.

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Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered By An Expert For Your Aid

By Joe Bell

AN INTERESTING little "stunt," one that shows that the originator was a thinking man, may have been seen by anyone who has noticed the army of Fords that are used for delivery purposes, and who found during the winter that many of them were running without the foot boards. In the summer, the heat of the engine makes these boards so warm that it is well nigh impossible to keep the feet on them—and this is true of other cars than Fords. Common sense, therefore, shows that it is a good policy to remove these boards to get the full benefit of this warmth on the feet and ankles, at a time when that warmth is so very acceptable.

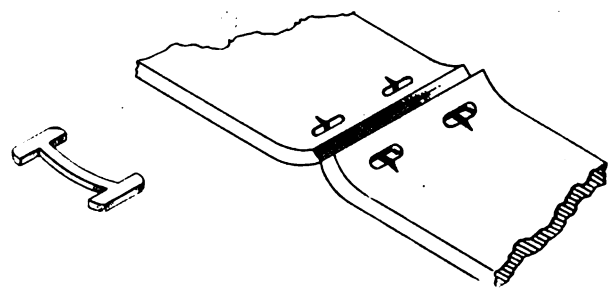
WHEN a new and useful device comes out, everyone exclaims, "Why didn't somebody think of that before?" To wit, at the Auto Show there was exhibited for the first time a hydraulic jack for cars—a plain round tube with a flange top and bottom and a handle to operate by. That's all there was to it, externally. A child can raise the heaviest car with such a jack. Funny, now you come to think of it, you've often seen these same hydraulic jacks—"whiskey jacks," they call 'em—used on the railroad and seen one man working a little short lever but at the same time lifting fifty or sixty tons with his jack. Why shouldn't the same principle be made to lighten the burden of one of the disagreeable tasks of motoring for us?

BUICK owners who grind their own valves have been more or less "stuck" in getting the cages out. There are cage pullers on the market, one of which is advertised in this magazine but the average owner waits until he gets started on a job before he thinks of these things and then it is too late, for that time at least. The valve springs and the rocker pedestals are in the way so that the method of prying the cages out is very apt to bend the stems.

One sure way to remove the cages is to remove the bonnets and rocker arms—then to give the hand crank a few vigorous twirls. Any cages that are going to come out without a puller will respond to this treatment but the astonished owner will have to gather them up from the pan and the floor after dodging the shower himself.

A better way is to take a piece of burlap or stout cloth and tie this securely over the engine pulling it down close to the cylinder heads; the cloth retains the cages in their respective bores, avoiding the possible loss and damage from the open top method. The cages fit snugly and when they have not been removed in some time, they resist pulling. Sometimes they may be soaked loose with kerosene and again, they will come out if pulled when the engine is thoroughly warmed up.

THOSE garages which boast of some machine tool equipment know all about the many insignificant, but annoying, details that crop up in the maintenance of that equipment in running order. One of them is belt fastenings. The most exasperating thing imaginable is to be



An Ideal Fastening

doing a hurry job and to have the machine belt come apart: by the time you have culled an old knife from the junk on the bench and found the remains of a hollow punch and located a piece of soft wire or sent Jimmy to the nearest hardware store for a rawhide lace—by the time you have done that and got the belt put together again, not less than half an hour of time has elapsed.

One of the best all around fastenings that the writer knows of—and he has used them all, is a little piece of brass that has been stamped out into an H shape, as shown by the drawing. A slot is cut or punched for this stud in both ends of the belt and then one leg of the H is slipped into each. As shown, it does not make a flat joint but that is immaterial in the writer's opinion. A box of these studs costs only what is involved in that lost half hour, yet in a shop with four or five machines that box should last ten years. For belts that are shifted by hand, this fastening is the safest the writer knows.

A GOOD MANY drivers have the habit of throwing the car in gear when it is left standing along the

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street, as an additional means of braking. Sometimes the driver forgets to push the lever back to neutral before starting—then, if the car has a starter, the latter merely stalls, while if the car has to be cranked some amusing or disastrous incidents are sure to follow. It has happened more than once, when a car has been run in a home garage and left in high, that a swift twirl of the crank has pushed the front spring ends right through the flimsy back wall of the building and has pinned the cranker in a position that was uncomfortable to say the least.

An amusing incident occurred in front of the Empire Garage when a leading citizen, having left the car in reverse, gave the crank a mighty twist, starting his trusty Studebaker backwards along North St. to the infinite amusement of the passers-by who thoroughly enjoyed the leading citizen's efforts to hold the car by clawing at the radiator. Moral: always jiggle the lever around until certain it is in neutral, before touching the switch.

THE inner sleeve of a roller bearing often gives no end of trouble in getting it off an axle shaft. This is particularly true when it butts against a shoulder, for the remaining projection is too slight to retain any tool used behind it. One way to remove these sleeves is to heat them but that scheme is objectionable because of possible damage to the shaft. A better way is the hammer method. If no anvil is available, a piece of rail will do—with this is needed a hammer of not less than 1½ pounds weight. The sleeve is laid on the anvil and pounded with the hammer, directing the blows from end to end and turning the axle. This loosens the rust, if any, and stretches the metal in the sleeve enough to relieve the grip on the axle.

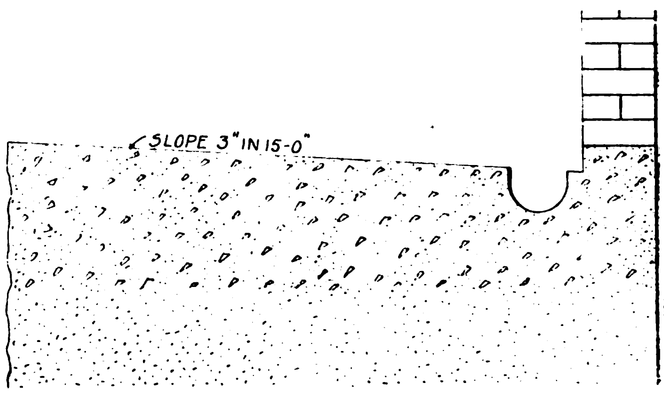
THE inner sleeve of a roller bearing often gives no end being towed in when he might continue under his own power if he knew more about his car or those who are sent from a garage to help were similarly informed. Bill Houston was a graduate laborer who had risen in his newly chosen profession through the car washing route. Occasionally he was allowed to drive a car, as on this busy Sunday afternoon when I vaulted into the seat beside him as he was making a regular fire department getaway from the garage.

"Car stuck out on the Bloomingburg road, I'll get her in with this old bus, all right," was the explanation I got. Bill was some driver, it proved—he went out better than thirty-five an hour and he came back with his tow just as fast. Arrived at the car, it was found that the party had stopped by the Willows to enjoy the view and when they had attempted to start, the engine wouldn't run. The owner was making one of his first trips in his first car, a second hand one. Bill made a good impression on the party by his energetic, decisive methods.

First he looked to see if there were gas, then (with the switch off!) he spun the crank several times—no response—and finally he turned the switch on and pressed the starter button. "No use, she's dead as a rat," he informed the party. Never a look under the hood for a loose or broken wire. "But pile in, I'll get you to town with my old bus, don't worry." It seemed to me, however, that the poor driver behind—a new man at the wheel—had ample cause to worry on the ride to town behind Bill. Score one for the H. C. of Towing.

WRIST pins of the type that is fast in the piston wear small from the action of the rod bushing. This wear occurs on the lower side and may amount to one or more thousandths—enough to cause a knock even with new bushings. If, for some reason, new pins cannot be obtained, a very passable job may be made by turning the old ones around 90 degrees. This fills the bushing top and bottom and eliminates the knock. The amount of side play is negligible. Of course this method does not give the bushing a full perfect bearing but it will last for a long time. The wrist pin must be re-drilled for the cotter or set screw, which will involve drawing the temper on that spot or grinding through the "case."

GREG called to me to come over and see his new garage and I'm glad I went. He had erected a neat two-car garage toward the rear of his lot but the thing I noticed particularly was the floor. It appeared to slant toward the rear of the building and when I asked him if his floor was level, he said, "Oh no, I had it sloped three inches down at the back—three inches in fifteen feet." And then he pointed out



The Slanted Garage Floor

the drain at the rear, ending in a two-inch pipe passing through the wall and emptying in the yard outside. This construction differs from the usual one of making a concrete floor sloping all four ways to a drain in the center which is nice for washing the car but has a number of disadvantages such as a floor that is not level in any direction and the drain being a catch-all

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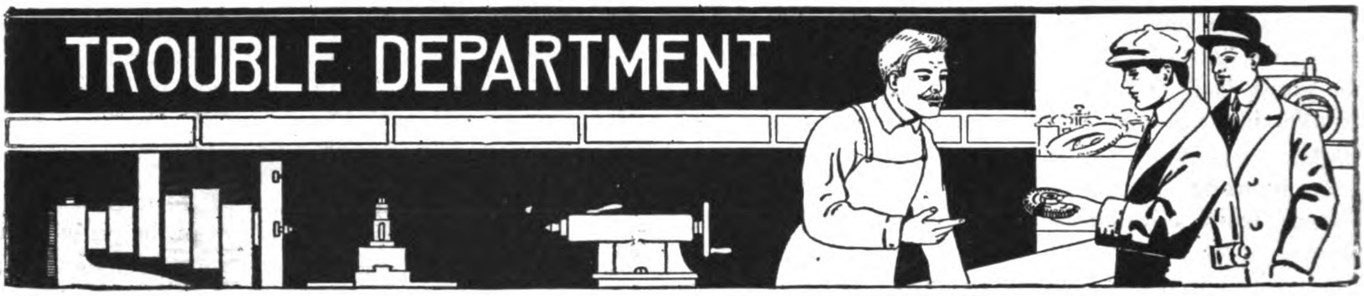
for everything movable as well as an awkward place to drop small parts in when working on or under the car.

The straight, sloped floor, however, has slant enough to carry off the water but hardly enough to cause anything to roll away when dropped. Then the catch drain at the end is open on the top, so it's no trouble to pick out anything valuable that gets in it but the opening comes at a point where it cannot possibly be a disadvantage.



Knock in Timing Gears

2972

From Amede Gauff, Louisiana:—Will you please tell me how to remedy the noise in the timing gears on a Gardner, light four, 1920 car? The gear knock is clearly heard especially at low speeds.

Reply:—Gear knocks arise from either or both of two causes: worn bearings and worn gears. Since the question is relative to timing gears it is safe to say that if there is any bearing wear it will be in the cam-shaft bearing or bearings because if it were in the main bearings the knock would be heavy and more noticeable at high speeds.

A careful examination should be made of the bearings with the idea of locating either end play or side play. In many cars the cam-shaft end rests against the timing gear housing and a spring with a small thrust washer prevents the cam-shaft from shacking endwise. A weak spring at this point allows the cam-shaft to play endwise and cause a knock. The remedy for this trouble is obvious, install a new spring or new thrust washers as may be necessary. If the bearings are worn, then install new ones. (See article on bearings in this issue.)

If the trouble has existed for some time it is probable that the gears are worn and the machine will not run quietly until new gears are installed. It is advisable to install a whole set rather than one because a new gear, running with a worn one will soon be destroyed.

Graphite in Automobile Engines

2973

From L. J. Hathaway, Maryland:—What is the latest and most authoritative opinion as to the use of graphite in automobile engines? Should this lubricant be mixed with crank-case oil, fed dry into the intake manifold, etc.?

Why does an engine run hotter and carbonize more rapidly when running idle, than when operating under a load?

In cleaning water jackets "Soda" is sometimes used. What kind of soda is this? Where can this be purchased?

Reply:—For ordinary work, flake graphite may be mixed with the lubricant and placed into the crank case, but there are exceptions to this rule. A notable exception is the case of the Ford where the magneto is lubricated with the crank case lubricant. Should graphite be placed in the Ford crank case it might result in the short circuiting of the magneto. Graphite, being one of the best of electrical conductors, has no place in electrical units where there is a chance that the graphite will come in contact with the wiring or contacts. Thus, if a generator or electric motor were mounted in a housing integral with and lubricated through the crank case, then graphite should not be used in the crank case. In such cases graphite should be fed through the carburetor air intake.

Graphite in flake form may be obtained at practically any accessory supply house and will mix readily with either oil or grease. It will be found that graphite, when fed through the carburetor air intake will often fill scores in the cylinder and improve the compression. For a time, at least, or until the free graphite has been driven off, it will cause spark plug trouble and these members will need frequent cleaning for the first two hours after the use of graphite.

When mixed with heavy oil or grease, graphite is ideal for holding the lubricant in place. This is an excellent preventative against oil leakage in rear axles. Graphite, either dry or mixed with a small amount of heavy grease is an excellent spring lubricant.

Aside from our caution aganist the use of graphite in electrical units there is another point which has attracted considerable discussion, namely the use of flake graphite in its dry form for lubricating ball and roller bearings. The writer does not advise the use of dry graphite for this purpose because of the fact that there is such a small amount of bearing play in these types of bearings and this necessary play will be eliminated when the parts are caked with the graphite.

An engine operates at a higher temperature, when running idle because it is cooled only by the breeze from the fan and because of the richer mixture necessary at low speeds. It carbonizes more rapidly for the latter reason. As the car is started the air passing beneath the hood increases in volume and the operating mixture can be made leaner.

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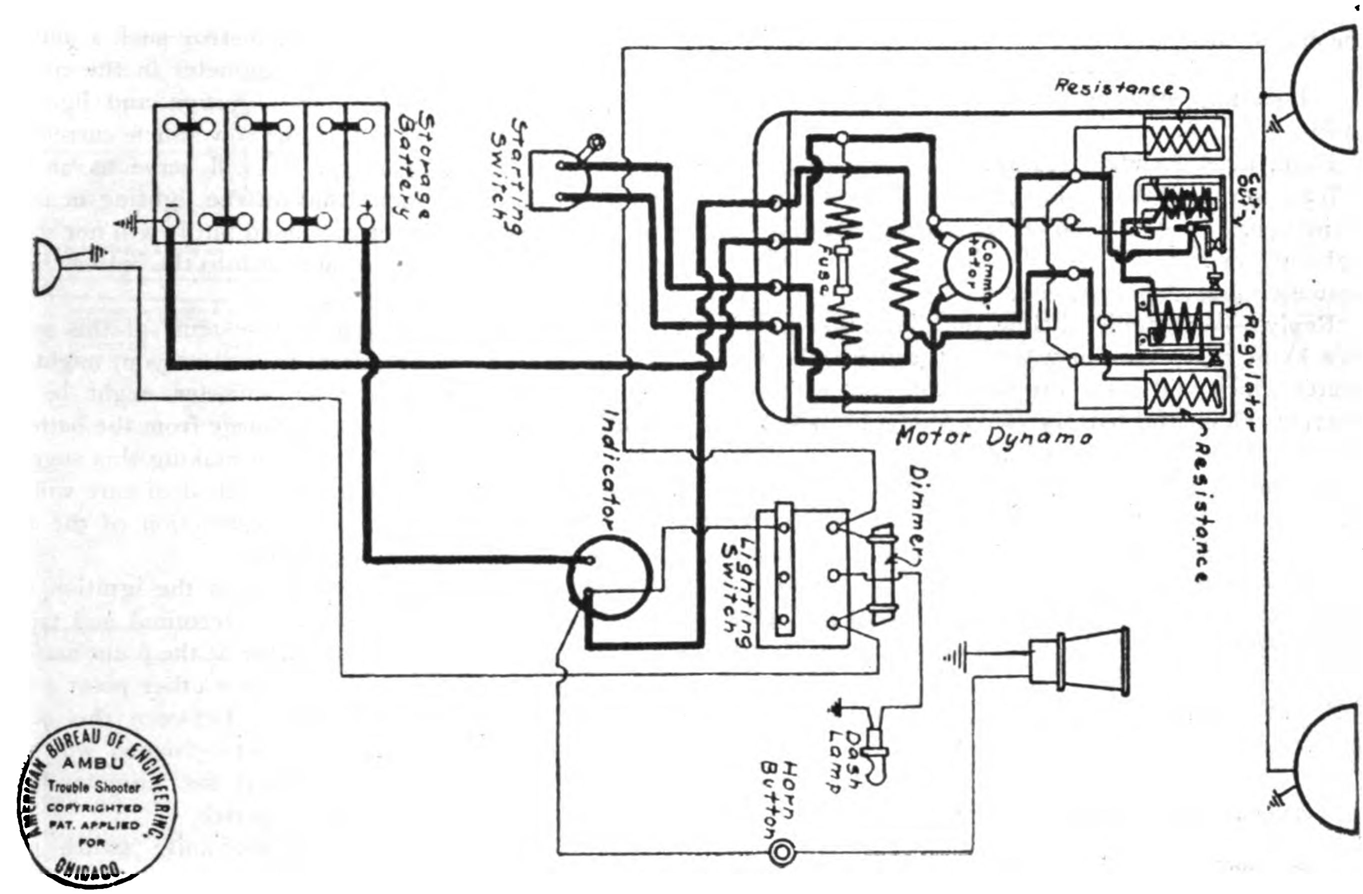
NORTH EAST Dodge 1916



Courtesy of American Bureau of Engineering.

The "Soda" used for cleaning the cooling system is the ordinary "Washing Soda" which can be purchased at any grocery. The chemical name for this is Sodium Decahydrate. This product comes in the form of large white crystals and has a strong affinity for grease which it dissolves readily.

Poor Compression

2974

From F. C. Smith, Connecticut:—I have a Buick four, year 1917. The first and second cylinders have little compression while the other two seem to have plenty. Would you advise me to install a set of new rings in the first two cylinders?

Reply:—Poor compression is not always due to improperly fitted rings and unless you are sure that the compression leaks past the pistons we would not advise you to go to the trouble and expense of fitting new rings. If, after making a careful examination you find that the compression leaks past the rings, then by all means install a set of rings in each of the first two cylinders.

It is strange that two cylinders have such excellent compression as you mention while the other two are quite the opposite. We are inclined to think that the compression leaks past the valves. Possibly the valves are not properly ground into place or possibly there is not sufficient clearance between the push rods and the rocker arms. Many drivers, in an effort to eliminate tappet noises, adjust the clearance so closely that the valves are held open much of the time. To obviate any chance from trouble in this direction set the valve adjustments so that the clearance is at least .005.

If the engine runs comparatively cool at all times you may be able to reduce the clearance slightly. A safe clearance can be figured as .002 *when the engine is hot.*

Wiring of Dodge 1916

2975

From Ed. Schilter, South Dakota: Will you kindly print a wiring diagram of the Dodge 1916 Touring Car? I should also like to know whether the lamps can be wired in some way so that I might use them without the storage battery.

Reply: We print above diagram of the wiring used on the Dodge 1916 touring car, equipped with the North East system.

You can operate this machine on dry cells, for lighting and for operating the electric horn by placing the cells with the same connections as the storage battery. The battery should be removed and seven or eight dry cells used. Be sure that the carbon side of the cells is connected with the wire which leads to the current indicator. In addition to this you should remove the fuse from the generator fields.

If there is no fuse on your model generator, remove the

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carbon brushes or, better still, disconnect the generator from the driving shaft by removing either the coupling or the driving gear.

Installing Ammeter on Ever Ready System

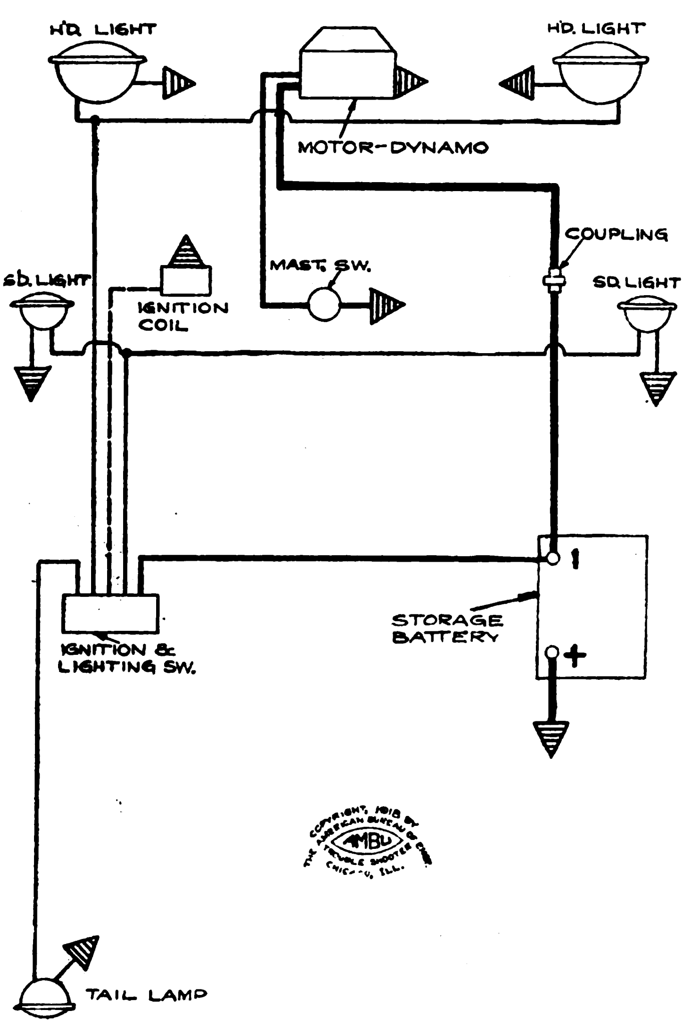
2976

From L. E. Kendall, Maine:—Will you please publish a diagram of the wiring on a Ford car, upon which is installed an American Ever Ready starting and lighting system? Will you also indicate where an ammeter should be installed?

Reply:—We publish below the diagram requested. We know of no way in which you can install an ammeter which will show the total charging rate or the current which the battery is receiving from the generator. As will be noted by an examination of the diagram there are but two wires connected with the storage battery which carry all of the charging current. One wire connects with the car frame and the other with the motor-generator. The third wire which connects with the battery carries the current for lighting and ignition only. This third wire carries no charging current.

Unfortunately the wire leading to the motor-generator from the battery carries the starting current for the motor when the latter unit is in use and for this reason it would not be practical to put an ammeter in this line for the current would distroy such a unit.

AMERICAN EVER READY – FORD CARS



Courtesy of American Bureau of Engineering.

If you choose to install an ammeter in the circuit between the battery and the ignition and lighting switch the ammeter will show how much current is being used from the battery. It will serve as an indicator of trouble should any of the lighting or ignition wires be crossed or grounded but it will not show the amount of current being sent into the battery from the generator.

There are so many types of systems of this same kind that our other readers, as well as you, might be interested in knowing how an ammeter might be installed to show charge and discharge from the battery. We will give a suggestion but in making this suggestion we wish to state that the greatest of care will be necessary at all times or the destruction of the ammeter will result from the neglect.

Remove the wire, which leads to the ignition and lighting switch from the battery terminal and tap it into the motor dynamo wire either at the point marked "coupling" in our sketch or at some other point a few inches away from the battery. Between this point and the battery cut the heavy motor-dynamo wire and insert an ammeter. Short circuit the ammeter by a heavy wire and a heavy knife switch.

While the engine is running the knife switch may be opened and the ammeter will register "charge" or "discharge" as the case may be. But before the current from the battery is used for starting the motor the knife switch should be closed to short-circuit the ammeter and prevent that unit from being burned out by the excessive starting current. If you will observe this one precaution you will have no trouble, otherwise you will be obliged to purchase new ammeters from time to time.

Overhauling a Car

2977

From a Massachusetts Subscriber:—Will you please send me details, in the shape of an outline for overhauling a Dodge Car? By this I mean a complete overhaul. I am interested in doing the work in sections rather than all at a time.

Reply:—The first article in the February number, entitled "Spring Cleaning" was one of a series of articles dealing with the details of overhauling an automobile. You will find the third of this series in this issue.

In this series of articles we planned to take up the details of a complete overhaul and to take up the details as they should be attended to, in the easiest way for the owner. Naturally it is wholly impossible to overhaul a car completely and yet have it ready for use at a moment's notice. If the car is in fair condition the work may be arranged so that the car will not be laid up for a long period by following a procedure as outlined herewith.

(1) Remove cylinder head; grind valves; scrape out

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CADILLAC 1912 MODEL DELCO

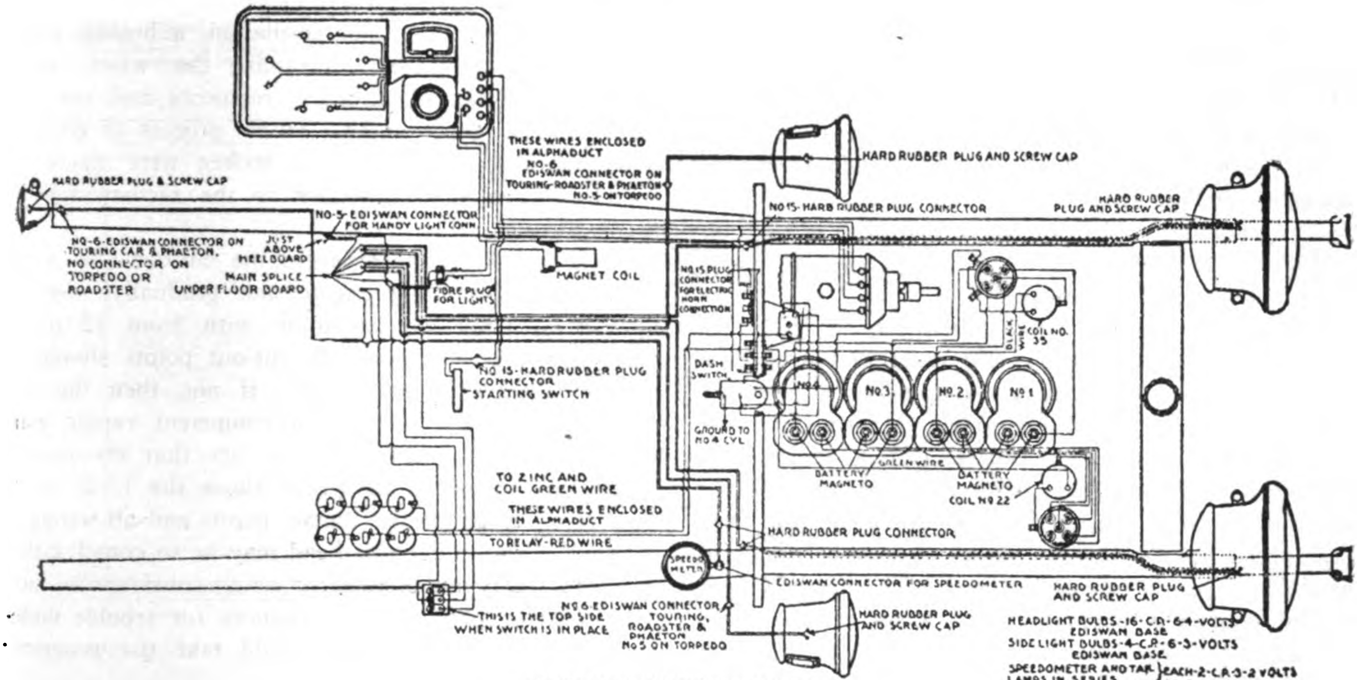

DIAGRAM OF WIRING FOR 1912 CARS.
TOURING-TORPEDO-ROADSTER & PHAETON

Motor Generator No. 1
Battery—Type 12-SD-3

Ignition Coils Nos. 2022-2045
Ignition Switch No. 1018

Courtesy of Dayton Engineering Laboratories Company.

carbon; install new valve stem bushings; clean water jackets; replace piston rings if necessary; repair wrist pins, piston, etc.

(2) Scrape connecting rod bearings; repair and scrape main bearings; fix cam-shaft bearings; clean oiling system.

(3) Repair electrical units such as generator and motor; replace wiring when necessary.

(4) Overhaul ignition system if not attended to under step (3).

(5) Overhaul steering gear.

(6) Overhaul front axle and steering gear linkages; line up wheels.

(7) Overhaul rear axle; differential and bearings.

(8) Repair and adjust brakes.

(9) Overhaul and repair gear-set and clutch.

By following this outline you will be able to use the car between each step of the outline, although it is not so practical to re-assemble the engine between steps (1) and (2) because of the connecting rod repairs involved. The same is true between steps (7), (8) and (9) because of the fact that generally the gear-set must be removed before the rear axle is in place again.

Wiring of Cadillac 1912 Car

2978

From J. Schaffer, Minnesota: I would like to have you furnish me with a wiring diagram of the Cadillac Model 30, year 1912. I am having trouble in starting this engine because the secondary spark does not seem to be hot enough, despite the fact that I have installed a new coil and a new condenser on the distributor.

I have noticed that when the wire leading to the breaker box is connected with one of the posts, I can get a spark through the ignition switch in either of its positions, "Mag," "Bat" and "Off."

Reply: We reproduce herewith a wiring diagram of the system used on the 1912 Cadillac car. In all probability the breaker box on this machine was of the "closed circuit" type. That is to say, the contact points are together and current passes through them until the moment that they separate. Since this moment of separation is the time when the piston in one of the cylinders is at the top of the compression stroke, the points are usually in contact because the engine seldom stops at the "broken contact" point. It follows that you will usually obtain a spark at the switch.

We are inclined to believe that your trouble is caused by either a short circuit in the ignition wiring or by an improperly grounded unit. One side of the condenser is connected by a wire with one side of the breaker box while the other side is grounded. The condenser housing should be scraped free from dirt and lacquer so that it will make a good electrical contact with the ignition head. Be sure that the switch is grounded also.

Insufficient Charging Current

2979

From C. A. Walbridge, New Hampshire:—Will you kindly send me the wiring diagram of Model 35H,

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1914 Mercer? The generator will only deliver five amperes, at all speeds, which is insufficient even for supplying the lights. The brushes and commutator are in good shape and all of the connections are tight. Will you please tell me how to adjust the machine to give a higher charging rate?

Reply:—Possible troubles are as follows:

(1) Loose, Grounded, or short circuited wires and connections either inside or outside the generator.

(2) Commutator, Brush and armature trouble.

(3) Cut-out trouble.

(4) Internal Generator trouble.

We will take these points up in the order given.

(1) Examine the internal and external wiring connections and see that they are not loose or corroded. Scrape all connections where joined to terminals. Pay particular attention to the wires leading to the cut-out. Bear in mind that a wire may break inside the insulation without an external evidence of the fact. Pay special attention to the wires and connections for the field coils. Brush connections with the field coils may be poor due to corrosion of brush carriers from heat and from dirt thrown off from the commutator. The charging rate of the generator of this model is dependent upon the balance of current running through the two field windings. If the reverse series field coil receives more current than it should, in proportion to that of the main field coil, then the output will be lower than that which it was designed to furnish.

(2) Watch for excessive sparking at the brushes. The brushes may be of poor material or the wrong size or may not fit the contour of the commutator. If the sparking is not due to these causes or from metal imbedded in the commutator insulation, a broken armature wire is indicated. Examine the wires which connect with the commutator segments and see that they are properly soldered. If, by process of elimination, you find that there is a broken wire inside the armature then send this unit to the factory for repairs.

(3) Remove the cover from the cut-out and watch its action. Start the engine and gradually speed it up. At a point corresponding with from 12 to 15 miles per hour car speed the cut-out points should be brought together automatically; if not, then the cut-out should be adjusted by a competent repair man. Speed the engine still more and see that the cut-out points stay closed at all speeds above the 12-15 m. p. hour rate. Examine the contact points and all wiring.

(4) Trouble under this head may be so complex that it is practically impossible for us to consider the subject. Having eliminated all chances for trouble under the first three classes you should take the generator to a competent repair man.

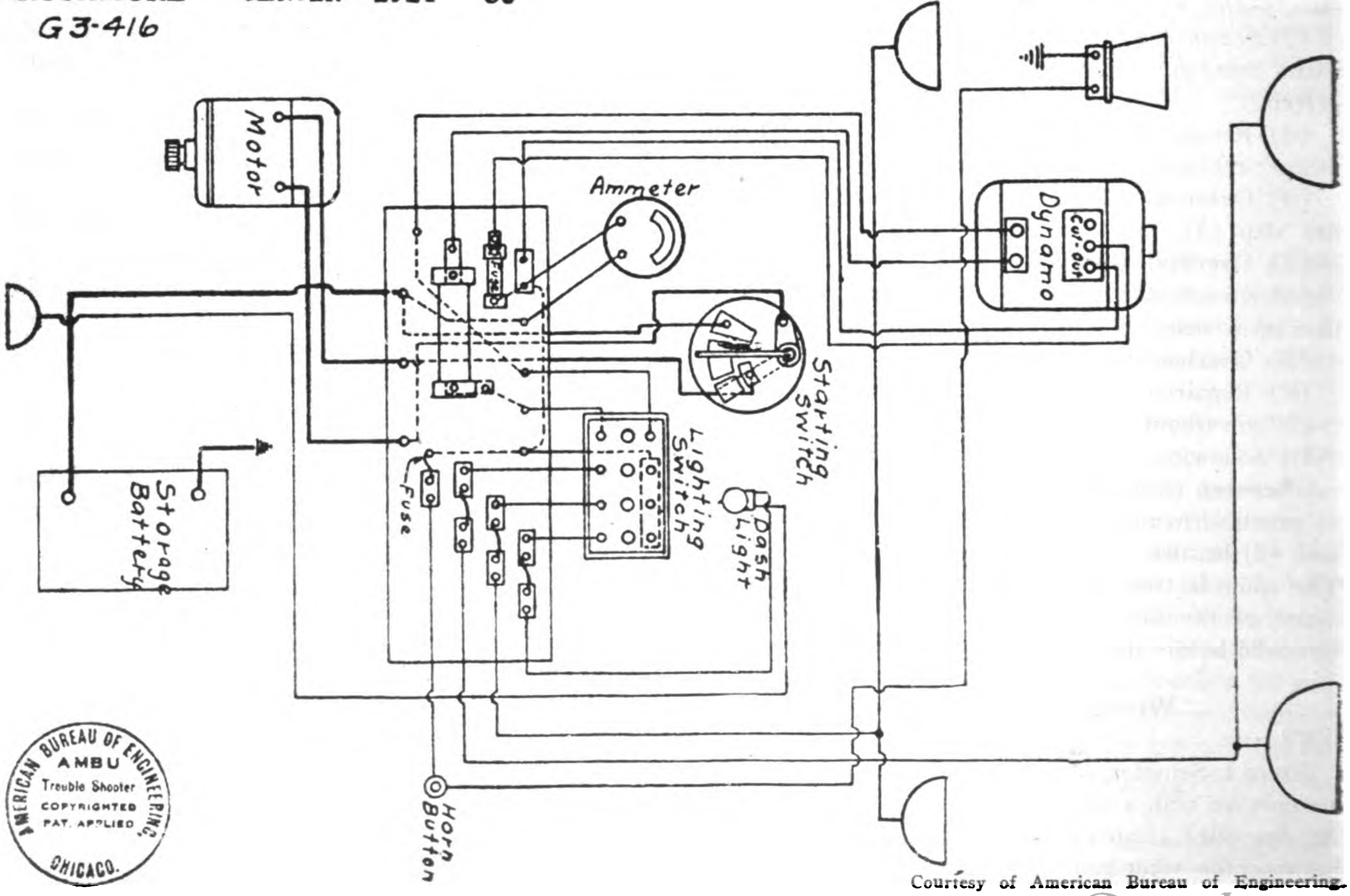
A wiring diagram of this machine is reproduced herewith.

Fitting Piston Rings

2980

From Ernest O. Krieger, Indiana.—Will you please

RUSHMORE MERCER 1914 "35"



Courtesy of American Bureau of Engineering.

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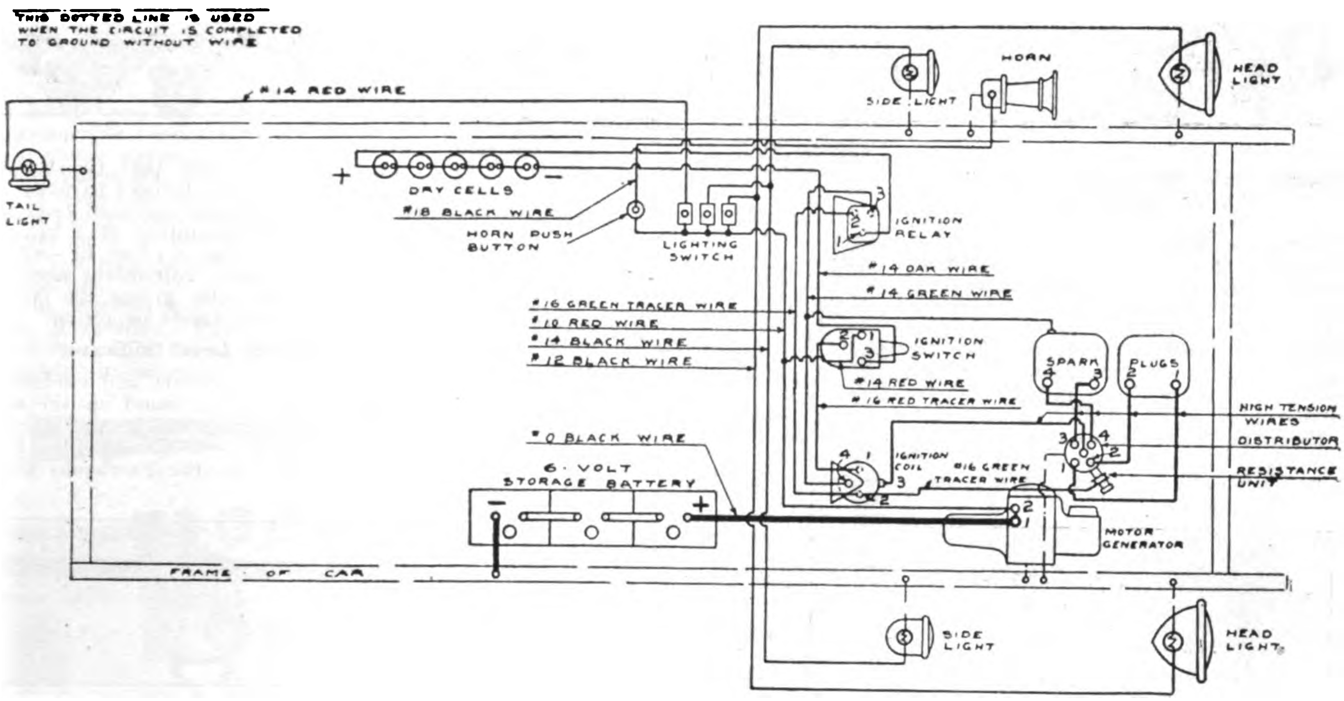
BUICK 1914 MODEL B-24-25



Motor Generators Nos. 26-40
Battery—Type 3-X-15-2-A

Ignition Switch No. 1034
Ignition Coil No. 2107

Courtesy of Dayton Engineering Laboratories Company.

answer the following questions regarding a Studebaker, Model 4 car? I have had the cylinders reground and new pistons and rings fitted. How long will I have to run the machine before the rings are tight and the compression is at its best? What is the proper height for the float in a Schebler Model R carburetor? What causes the car to operate jerkily at ordinary speeds and stop entirely if the car speed drops below ten miles per hour?

Reply.—We have always contended that, if pistons and rings are properly fitted in the first place, the engine will have excellent compression to start with and gradually improve until the rings fit properly. However, we realize that there are a few piston ring manufacturers that put out rings which they claim should be "run in" rather than fitted. Such rings should be worn to a fit within 1,000 miles of running or even less, depending upon the lubrication of the engine.

The level of gasoline in the float chamber of any carburetor should be not less than 1/8 or more than 3/16 of an inch below the needle valve opening. To test this level, plug up the gasoline inlet connection and fill the carburetor float chamber, to a point between 1/8 and 3/16 of an inch below the needle valve opening with gasoline. Then bend the float arm until the inlet valve, on the end of the float arm is closed. A little patience with the adjustment will give a satisfactory job.

The reason why your engine will not give power at low speeds is probably because the compression leaks past the rings at present. As the rings wear into place his trouble should disappear.

Wiring of Buick 1914-25B Car

2981

From C. E. Warrenfeltz, Maryland: Will you please print a diagram of the Buick 1914 car; model 25B? Will you also tell me how an ammeter should be applied in the circuit to show the charge and discharge of the generator?

Reply: We are giving you herewith the wiring diagram of the Buick Model B-25; 1914 car. You will note, in the drawing, that the motor generator is fitted with a double terminal marked 1 and 2. Terminal number 1 connects with the positive side of the battery and number 2 connects with the switch.

This wiring should remain just as it is but the strap which connects number 1 with number 2 should be cut and one pole of the ammeter connected with number 1, the other with number 2.

In some of the generators this strap is inside the housing, but you cannot connect an ammeter to show the charge and discharge unless this strap is cut. With the ammeter in the position described it will give the charge and discharge rate and so tell whether the generator is working properly or not.

BLAME THE DRIVER

He tried to walk across the street with his legs, light his pipe with his hands and mouth, see a pretty girl with his eyes, and think about his errand with his brain, all at one and the same time. And now he ain't.

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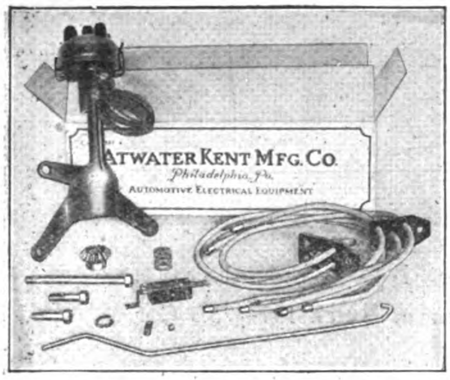
New and Useful Automobile Accessories

Atwater Kent Mfg. Company Puts New Product on the Market

A real contribution to the array of numerous devices for improving Ford car operation has been made by the Atwater Kent Mfg. Company, Philadelphia. There has been a long felt want for a high grade ignition system suitable for installation on Ford cars, and yet which will be within reach of the pocketbook of the average Ford owner.

For a long time, the engineers of the Atwater Kent Mfg. Company have been working on the problem and the Company has just placed on the market the Atwater Kent type CC ignition system for Ford cars. The exceedingly low price includes wiring and high tension cables, and all parts necessary for the installation. The outfit can be applied very easily and quickly.



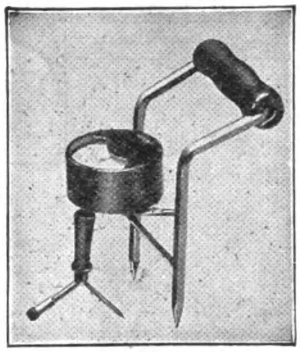
The contact maker and distributor which is identical in design and quality with the ignition system used by manufacturers of high priced Atwater Kent equipped cars, is located on the front of the engine, in place of the regular Ford timer. It is mounted on a bracket where it is protected from oil and dirt, and easily accessible.

Not the lesat important is the fact that the purchaser does not have to throw away the coils and coil box. By a unique adaptation, one of the regular Ford coils is used to step up the primary current. The vibrator is screwed down and an adapter unit connected in series with the coil. This arrangement provides three additional coils for emergency use, any one of which may be cut in by changing the connections.

It is said that the Atwater Kent system is a revelation to those who have already installed it. It does away not only with the troublesome commutator and vibrators, but effects a real saving in repair bills, and adds tremendously to the performance value of the car. Cold weather starting is made easier, and in driving one can bring the car down to much slower speed than usual and the engine still pulls steadily in high gear. The perfectly synchronized spark also results in greater efficiency from the present low-grade fuel, thus increasing the mileage.

Hyrate Battery Anylizer

Recent experience has indicated the practicability of the Hyrate discharge method of testing automobile batteries. In line with this now recognized practice the Service Station Supply Co., of 30-32 E. Larned St., Detroit, Mich., have placed upon the market an instrument known as Hyrate Battery Anylizer, for analyzing, which preserves the very excellent feature of making a high rate discharge through patented Chromel resistance and combines with it the unique arrangement of a third terminal volt meter of an easy reading type. Attached to the third terminal of the meter, by means of a flexible lead, is a fork spike as shown in cut. One spike of the fork is the test point for voltage test and the other spike is the Cadmium electrode for making Cadmium test.



It is fairly well established that the Cadmium test and the open circuit voltage tests are desirable in determining the condition of either group of plates within the cell without actually dismantling or opening the battery.

The Hyrate Battery Anylizer is a complete battery testing oufit, capable of making three different kinds of tests of storage batteries, as follows:

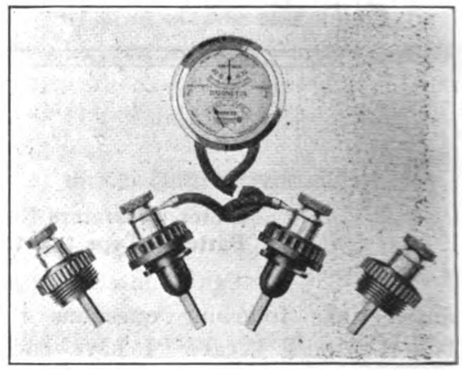
High rate discharge test—Plain voltage test—Cadmium test.

In addition to the original two terminals of this instrument a third terminal has been added from which a calibrated resistance leads to the moving coil of the instrument itself. To this third terminal is attached a flexible lead as described above. The addition of the third terminal and lead (which is removable as a matter of convenience) in no way interferes with the use of the instrument as a Hyrate Cell Tester. However, when it is desired to take open circuit voltage readings or Cadmium readings, either one of the prods of the tester is applied to the positive terminal of the battery and the lead connecting the third terminal of the instrument is applied either to the other terminal for open circuit reading or the Cadmium spike electrode is immersed in the electrolyte to give the positive Cadmium readings. For the negative Cadmium reading the prods are merely shifted to the negative terminal.

It is therefore said that the Hyrate Battery Anylizer can be used to make the two general accepted essential tests for determining the condition of a battery, and in addition thereto can be universally used for mere volt meter work on storage battery cells, giving the instrument a very wide range of action.

A Water Level Indicator

A real aid to comfort and confidence in car operation is found in the new Batometer, manufactured by the Hempy-Cooper Mfg. Co., of Kansas City, Mo., and distributed by the Fairbanks Company of New York City and elsewhere.



The Batometer is a device mounted on the dash of the car, which indicates to the driver the level of the electrolyte in the storage battery. It can be used on any make of battery or car. The "Water" scale in the Batometer is connected by flexible wires to lead electrodes which are built in the regular filler caps. These electrodes project down into the cells almost to the tops of the plates.

While the electrolyte is sufficiently high the needle points to "High." When it falls below the ends of the electrodes the circuit is broken and the needle swings over to "Low." The Batometer does not wait until damage is done before indicating it, for when the needle points to "Low" there is still 24 hours to drive to a battery service station for an examination.

The Batometer will be sold through automobile accessory dealers and battery service stations. As an ammeter is mounted in the same case, the Batometer will replace the ammeter on charge-and-discharge indicator. The Batometer is furnished in flush or flanged types with the same outside dimensions as the regular ammeter or indicator.

New Catalog

The Continental Car Company of America, whose offices and works are at Louisville, Kentucky, have recently published a catalog of Ford Commercial Bodies. These catalogs are for free distribution to Ford dealers anywhere. Readers who are interested should write to this Company for a copy.

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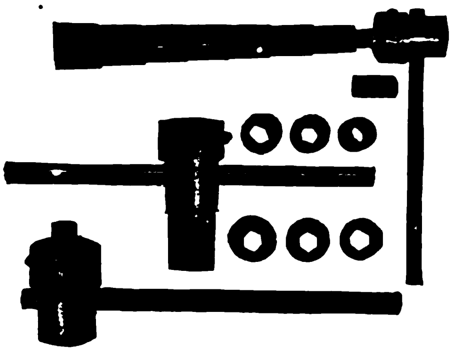
Bay State Wrenches

A very complete line of wrenches which is now on the market, is manufactured by the Bay State Pump Co., Boston 27, Mass. It is claimed that these Bay State Broached Socket sets will not crack when subjected to severe strain. It is also said that they are machine-cut from the best grade of solid cold steel and are carefully heat treated, in this way making them practically indestructible and able to withstand even severe abuse.

The Eagle No. 21 set which is illustrated herewith consists of a wrench which can be used either as a reversible ratchet or a solid wrench with either L or T handle and with or without extension bar.

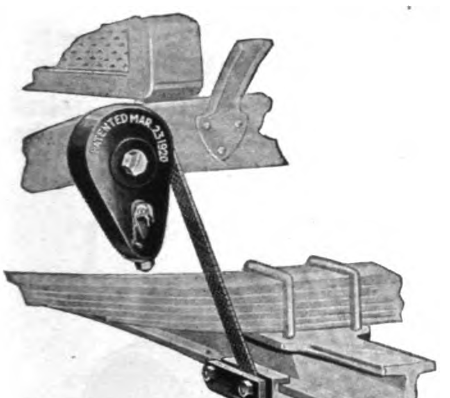
With this set is supplied a Combination Reversible Ratchet and Solid Wrench, one Extension Bar, one Removable Adapter, which is for use when the



wrench is applied direct to the socket, either ratchet or solid, and seven sockets in sizes from 15/32 of an inch to 27/32 of an inch. The whole is packed in a waterproof bag and the net weight is two pounds and eight ounces.

Bull Dog Bounce Absorbers.

There are probably more accessories made which are claimed to absorb shocks than any other kind on the mar-



ket. It is therefore difficult for the car owner to choose the accessory which is going to help him most.

However, it will pay readers to investigate the Bull Dog Bounce Absorbers, which are manufactured by the Channon-Hughson Co., 229 West Erie Street, Chicago, Illinois. These devices appear to be made on sound mechanical principles. It is claimed that they check the rebound softly by friction on the brake drum and that there is no abrupt harsh stop. They are easily attachable and require no oiling.

The Bull Dog Bounce Absorbers are made for Ford cars and for all other cars.

Neverflat

A solution which is compounded from a vegetable base and is said to cure rubber and stop punctures instantly is called "Neverflat," and is manufactured by the Majestic Auto Products Corp., 2 Columbus Circle, New York.

It is practically a liquid rubber and

the manufacturers claim that it becomes as hard and substantial as the rubber in the tire, the instant that it leaks through a puncture and reaches the air. The manufacturers also guarantee that this product stops punctures instantly, minimizes blowouts, will not injure rubber or fabric in any way whatever, but will preserve it, is not affected by heat or cold while in the tube and will refund money to any purchaser who is not satisfied with the results. It certainly will pay readers to investigate this product.

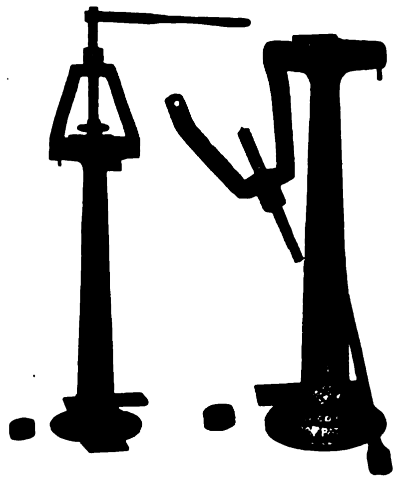
Kwix Soap

Every one knows how necessary it is to use a soap that contains no grit or acid and that acts quickly without injury. It will pay readers to investigate the soap which is manufactured by the Kwix Company, Boston, Mass. It is called "Kwix Soap." It is claimed that this soap cleans dirt, grease, ink, paint, etc. from the skin, woodwork, glass, tile, brass, automobiles, etc. etc. This soap can be applied without water; it is only necessary to rub it in and then wipe with a cloth or rinse with water.

Greb Rear Axle Press

The Greb Rear Axle Press, which is manufactured by the Greb Company, 197 State Street, Boston 9, Mass., is designed for removing axle and drive shaft gears and pressing on axle gears. This Rear Axle Press No. 12 has a capacity of shafts up to one and one-quarter inches and gears up to six and one-half inches. It is said that it will remove connecting rod wrist pins, timing gears and spindle body bushings.

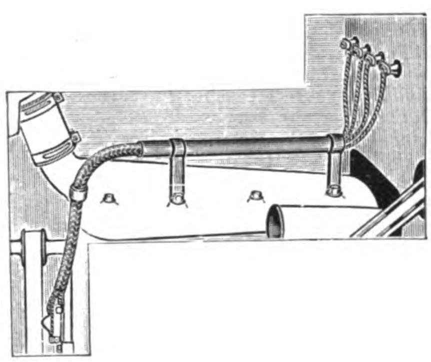
The manufacturers claim that it can be used for straightening connecting rods or other small work. By pushing the base plate to one side a solid base is secured for the axle to rest on, and by pushing the plate in the opposite direction the hole centers with the hollow shaft allowing the axle to pass through the base. This tool has a great many other features which will undoubtedly appeal to repair men and garage men.



The Greb Company will be glad to supply readers of the Automobile Dealer and Repairer with full information regarding this Press and all inquiries will be carefully attended to.

Alcemo Timer Wiring System for Ford Cars

Many Ford owners who complain of "leaky wires" would do well to investi-



gate the Alcemo Timer Wiring System for Ford Cars. This is a direct overhead connected between the coil box and the commutator and it is claimed that it saves forty per cent spark waste, thus delivering to the motor the full intense hot spark. It is claimed that this system saves the spark from "continuous combustion," eliminates carbon trouble, saves oil and gas and prevents "rippling" of the commutator. It can be attached in less than twenty minutes and is enclosed and protected from the oil.

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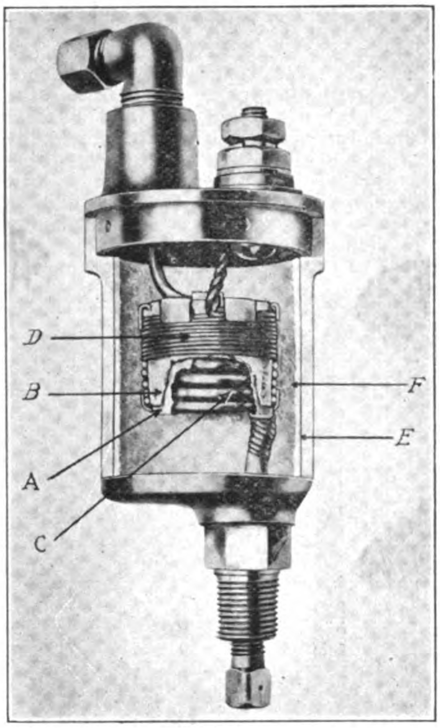
B. & L. Hot Gas Petrolizer

Design of apparatus for making it easy to start an automobile engine on a cold day has taxed the ingenuity of inventors for many years, but there has recently been introduced by the G. B. Van Buren Co., 522 Fifth Ave., New York City, an electrically operated Hot-Gas Petrolizer which is said to make it possible to inject right into the intake manifold any volume of hot gaseous fuel and thus obtain instant firing.



The essentials of the B. & L. Petrolizer are: A heating unit 3 inches long which is threaded into the intake and which communicates by a copper tubing dash injector which in turn connects with the fuel lines. There is a switch and a small safety light which indicates when the heating unit is in operation and when it is not.

In operation the driver pulls a switch which permits current to flow into a resistance coil. This resistance coil surrounds a coiled section of tubing through which gasoline is permitted to flow when the injector is operated. In 10 to 20 seconds, the gasoline in the tubing is raised to such a temperature that action of the injector forces it out into the manifold in the form of hot gas, considerably finer than that produced on a hot day by carburetion and normal engine heat.

The heating unit itself is simply a copper wire coil encased in a brass housing as indicated in the photograph on this page. This resistance coil is separated from the coil of copper tubing by a sheet of copper and a sheet of mica. The resistance coil itself is wound with asbestos cord. As current flows through the resistance coil the copper tubing coil and hence the gasoline in it, is raised to a high temperature and the action of the injector forces the hot gas out through a small opening in the bottom of the Petrolizer, as a fine hot vapor. If there is any spark at all it is claimed that the mixture will fire.

Application of the switch not only turns on the current in the resistance coil but lights a signal lamp so as to warn the driver the current is on. Apparatus takes small amount of current.

The Kompact Split-Rim Device

We illustrate herewith a device which is designed to facilitate the handling of automobile rims of the split type, of every make and size. This accessory is called the "Kompact Split-Rim Device" which is manufactured by The Kompact Devices Co., 208 Warren Street, Needham, Mass.

All such rims are cut (split) in one place and various means are applied to lock them when expanded. While removing or replacing the tire, they must

be contracted—that is one end must be drawn in and under the other, and held there. It is an extremely difficult thing to do without a tool of some kind and it is said that the Kompact fills this need. The device weighs only three and one-half pounds, but it is claimed that with it one can handle the most stubborn rims. It is also said that this can be used as a wheel puller.

Full details may be obtained by writing to the manufacturers.

Handy Pet Cock Opener

Ford owners know that it is a tiresome job when driving a Ford, to get out and under in order that they may see when oil is required in the motor. The Handy Pet Cock Opener which is sold by the Nelson J. Quinn Company of Toledo, Ohio, is an extension handle to each oil pet cock which is brought out to the edge of the fender where it is easy to turn and thereby avoids all the trouble of the old methods.

It is only necessary to step out of the car and turn the lever and one can see at a glance whether oil is needed or not. This device is made of steel throughout and the extension rods are clamped to the pet cock handles without boring holes. These rods extend through a plate attached to the fender, thereby bringing the handles out to the driver's hand. Heavy coil springs are said to stop all rattling. It will undoubtedly pay readers to investigate this product.

The Diamond Jack

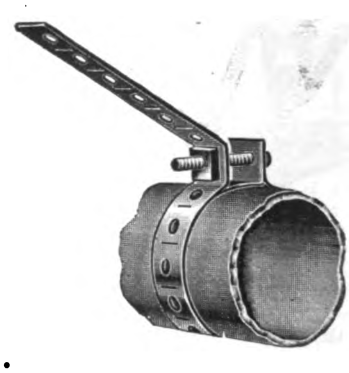
A Jack which is designed primarily for pleasure cars and light commercal vehicles is being manufactured by the Diamond Auto Parts Corp., 56-58 Greenport Ave., Brooklyn, New York, and is called the "Diamond Jack."

One of the features of this jack which

appeals to many, is the single acting automatic lowering and raising operation, which is executed with the down stroke of the handle only. The upward or downward direction is controlled by a small trip lever which is located near the operating handle. When this handle is not being operated the pawls automatically lock and the danger of accidental drop of load is said to be impossible.

Universal Adjustable Hose Clamp

The Universal Industrial Corp., Hackensack, New Jersey, manufactures the



Universal Adjustable Hose Clamp which is said to fit any size hose and which consists of a band of tough, cold rolled ribbon steel, a bolt and a nut. In this band there are holes every five-eighths of an inch with scores between the holes.

It is only necessary to clamp the band around the hose and insert the bolt in the nearest hole, then tighten up the nut and break off the overlap at the score. The whole operation requires but a minute or two and is very easily accomplished. The dealer needs only to stock two sizes to take care of all demands.

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Putting the oxy-acetylene blow-pipe in every man's hand

THERE isn't a factory nor repair shop in the country—whatever its size or location—that cannot obtain every benefit to be derived from the oxy-acetylene process of welding and cutting metals.

Prest-O-Lite Dissolved Acetylene in easily portable, economical cylinders supplies users anywhere with whatever quantities of uniformly pure gas they may require—whether they consume thousands of feet or just a few cylinders.

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New Steam Car Makes Its Bow

Rumors, current at the New York and Chicago shows that an important enterprise in steam motors is soon to be launched, have been definitely confirmed by George A. Coats, capitalist and representative of large steam interests, at 1213 Merchants Bank Blg., Indianapolis, Ind. Mr. Coats announces that he will manufacture and market a five-passenger, six-cylinder steam touring car of 110-inch wheelbase, with electric lighting and starting, to retail at about $1,000.

On the same chassis he will also build a commercial speed wagon for all light delivery purposes.

The Coats construction embodies several distinct advances which have interested leading steam engineers. For many months, the Coats experimental shop has been the terminal of pilgrimages by steam specialists from all parts of the country.

The operating models have been taken down and put together many times. Not a feature has escaped examination. The judgment of visitors, many of whom have gone on record, is that Mr. Coats has the construction that will "Put steam over"—that it will win the popularity that its advocates have long insisted it rightfully deserves.

In this non-technical news article, no attempt is made to examine the details as the engineers are doing. The boiler is of the combination fire-and-water-tube type, so arranged that it will go under a hood of any shape. The top and bottom welding of the tubes, equalizing expansion, reveals advances especially remarked upon by the experts.

The insulated steam line leads directly to the rear axle with divided flow to each half of the axle.

It is in this axle that engineers and laymen alike find one of the most fascinating advances in the Coats car—the direct application of the steam to the wheels, absolutely eliminating the geared differential.

The rear axle *is* the engine—or the engine *is* the rear axle—whichever way you choose to consider it.

It is engine, axle and differential function, all in one—the engine in its housing being just about the size of the ordinary rear axle gear case. It is without doubt the most compact engine in an automotive practice. The housing of each half of the axle carries three six cylinders, set at 120 degrees apart or one-third the circle. These cylinders are exactly like those of the automobile engine—with poppet valves, pistons and connecting rods. The bore is 2¾ inches, stroke 3 inches. The three connecting rods in each half are pivoted to a crank pin integral with the drive shaft of each wheel. At a speed of 40 miles an hour, the engine is running at the very low speed of 500 revolutions per minute.

It will be observed that an overlapping stroke is obtained. Before one cylinder is entirely off pressure, another has begun to take hold, and the third is completing its exhaust. In actual tests the Coats cars are doing 20 to 40 miles on one gallon of kerosene. With the Coats steam and water cycle, one filling of the water tank runs the car from 300 to 500 miles. The exhaust steam is taken by return pipe to the condenser which is located in front of the boiler in the position of the ordinary radiator. The initial heating for starting is electrical—controlled by switch on the cowl board.

The characteristics of steam are too well known to require analysis in terms of ordinary rating when applied to a motor car. As one well known expert said while watching the gauge of the Coats car register 600 pounds boiler pressure—"It has power enough to pull a switch engine."

Yet it is said to be smooth, velvety and flexible to a degree not possible to any other power. Its range in this car is not "three speeds" or "four speeds," but any speed from drifting to sixty miles an hour; and its whole range is controlled by one small lever on the steering wheel. There is not one gear in the power line of the Coats car. The power is never separated from the load to go from one speed to another. It is simply necessary to move the lever forward and apply more steam—or move the lever back and shut down on the steam. The acceleration, or slowing down, is immediate. The quick getaway of the Coats car is unusual. From a standstill under power, it goes right over a curb.

The vital point of difference between the steam car and others is its store of reserve energy.

In the Coats car the great energy stored in the boiler is always instantaneously available. It is built up in advance, is on tap for any emergency. It does not have to wait on combustion. It is a constant flow of power—free from the vibrations which attend the rapid explosions of the finest internal explosive engines made. There is no stored power in an internal explosive engine. As the power is used with each explosion, it is impossible to store it. The fly wheel is its only point of storage and power can be stored there only by speeding up—*after* the need of extra power is upon the car.

When the low price of kerosene or crude oil is considered with two or three times the usual car mileage per gallon of fuel, by these cars, it will be realized how practically the Coats enterprise is attempting to answer the call, ever more insistent, for economy in car operation.

The Coats car, completely equipped, weighs less than 1800 pounds. It has less than 40 moving parts. It eliminates carburetor, timing gears, magneto, clutch, gearshift, flywheel, accelerator, propeller shaft, universal joints and differential.

Of the saving of tires due to the equalization of weight, the reduction of vibration and the smoothness of interrupted torque, much might be speculated—but that is a point for demonstration in actual use.

In appearance the Coats car is attractive, but not at all radical in design. It has distinctive lines, for Mr. Coats has not underestimated the advantage of dress; and it provides more than usual five-passenger room for its size.

No stock is for sale. Abundant resources have been furnished for making and marketing the passenger car and speed wagon; and plans have been laid for an expansion of the application of steam on a scale which is not now ready for the announcement of details. It is realized by Mr. Coats and his associates that steam power and steam economy will be equally vital in truck and tractor use.

The origin of the present enterprise is interesting. At the beginning of the war, the Norwegian government sent an engineer to America to study the development of internal combustion engines. He had completed his reports and was preparing to return home, when Mr. Coats met him. The modest inventor laid before Mr. Coats plans for steam on which he had been working for years. These plans so interested the Indianapolis man that he promptly employed the engineer and established him in an experimental shop with a free hand.

The American automobile man's 20 years of experience and the Norwegian engineer's science were combined—with the counsel of the most experienced American steam and automotive engineers—and the Coats cars are the result.

"Hammering It Home"

One of the most novel and interesting of the displays seen at the Exhibit of the Automotive Equipment Association held in the Coliseum, Chicago, November 15-20, was that of the American Hammered Piston Ring Co. of Baltimore, Md.

The purpose of this display was to get across to the public the importance and value of the hammering principle as applied to piston rings. The desired effect was secured by building a large 60-inch piston ring in which were placed miniature electric lights. These lights flashed progressively, beginning at the extreme right of the ring and moving towards the left, in exactly the same manner as American Hammered Piston Rings are hammered.

The ring and lights were mounted in a large mahogany and velvet "shadow-box," and the lights were so placed that each ball point hammer mark was illuminated by the recurring flashes.

Besides the giant rim there were two small display balls, each mounting 12 American Hammered Piston Rings, every one of each had given continual service in motors for from 45,000 to 85,000 miles. These rings were obtained by American Hammered salesmen and were accompanied by letters from the car owners who had used the rings. Each ring had its own story and its own mileage verified by a letter from the man to whom it had given service.

A third feature of the Exhibit was a complete set of American Hammered Piston Rings showing every phase of manufacture, from rough casting to finished product. Two carefully designed scales provided the means of measuring the piston rings for the amount of tension put into them by hammering. The scales proved successful in convincing many skeptics of the value of hammering.

Removal of Westchester Accessories Co.

The Westchester Accessories Co., formerly of 1777 Broadway announce their removal to new and larger quarters at 245 West 55th St., (Michelin Bldg.)

They are now in a positon to take care of a larger volume of business due to the increased space which enables them to stock more goods.

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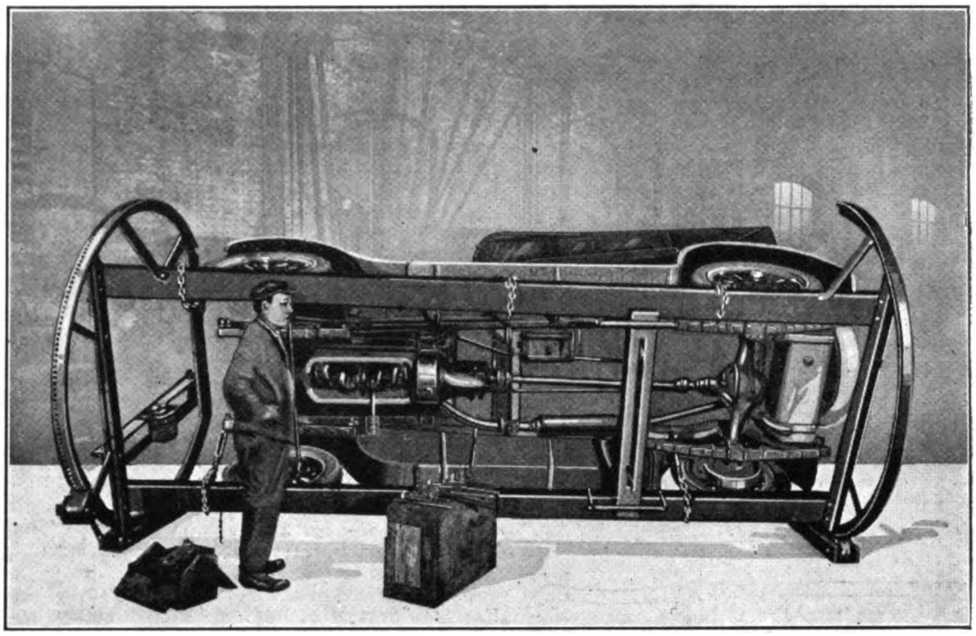
BETTER Work

MORE Work

At Less Than Half the Time and Cost



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No more dark pits, inclines and creepers! No more working in unnatural positions! No more half-finished jobs! Just run the automobile—any size, any kind—on the Turn-Auto and in a moment all the underneath parts are in plain view. Working on them, then, is as easy as if they were on the bench in the lightest part of your shop.

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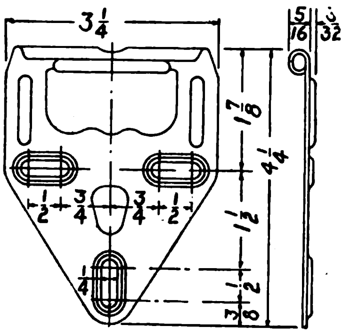
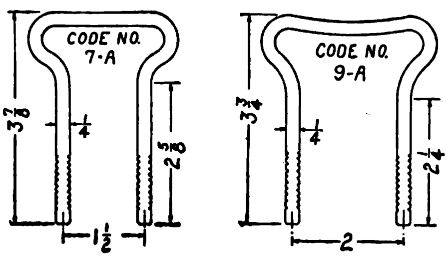
Mueller Battery Handles

We illustrate herewith three types of battery handles which are being manufactured by the Mueller Electric Co. 2135-45 Fairmount Road, Cleveland, Ohio. The No. 6-A is a narrow stamped type which is said to offer the manufacturer an opportunity to standardize





on one handle only for use on all of his batteries.

The use of slots in place of holes is something which has not been employed before. They make it possible for one to use this handle on boxes drilled for practically any other design of handle. It is also claimed that these slots allow for any inaccuracies in the drilling of the box and thereby quicken assembly. The device is lead coated by this Company's special dipping process and is deeply ribbed for strength.

Full information may be obtained by writing to the manufacturers.

Paige Adopts Remy Equipment

Both the Big Six and Little Six Paige Models are now being built with Remy Starting and Lighting according to an announcement just sent out to the trade.

In announcing the application of Remy equipment on these two models the Remy Electric Company of Detroit, Mich., proudly show Paige added to their list of a score or more regular users.

It is interesting to note that among the several cars listed, Remy has been standard equipment for five, six and seven years on most of them.

"American Hammered" Announces Promotions

According to a recent announcement by the American Hammered Piston Ring Company of Baltimore, Md., Mr. T. B. Blakiston formerly District Sales Manager for the Southeast territory has been promoted to the position of Assistant General Sales Manager, replacing Mr. J. H. Quackenbush.

Goodyear Tire and Rubber Co. Building, L. I. City, Purchased by W. C. Durant

First indications of the extensive plans for the manufacture of the new Durant Car have come to light in the announcement just made that Mr. W. C. Durant has purchased from the Goodyear Tire and Rubber Co. the eight story factory building located at the northeast corner of Jackson Avenue and Honeywell Street, Long Island City, New York. It is understood the consideration was $2,000,000.

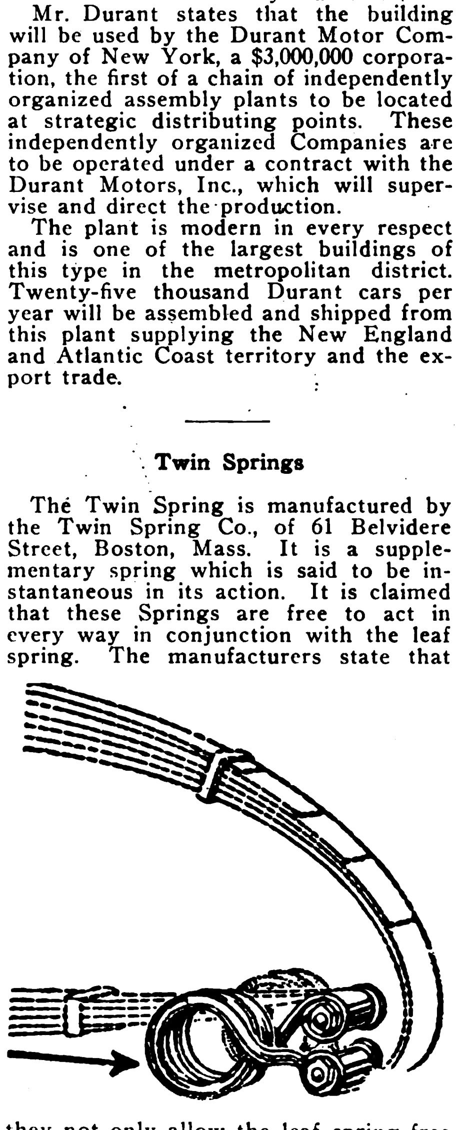
The building fronts 406 feet on Jackson Avenue and 238 feet on Honeywell Street and was originally built by the Ford Motor Co. as an assembly plant. The building has an area of approximately 500,000 square feet, is of reinforced concrete and steel construction and is located on the Long Island-Pennsylvania Railroad with side track accommodations for thirty-four cars.

Mr. Durant states that the building will be used by the Durant Motor Company of New York, a $3,000,000 corporation, the first of a chain of independently organized assembly plants to be located at strategic distributing points. These independently organized Companies are to be operated under a contract with the Durant Motors, Inc., which will supervise and direct the production.

The plant is modern in every respect and is one of the largest buildings of this type in the metropolitan district. Twenty-five thousand Durant cars per year will be assembled and shipped from this plant supplying the New England and Atlantic Coast territory and the export trade.

Twin Springs

The Twin Spring is manufactured by the Twin Spring Co., of 61 Belvidere Street, Boston, Mass. It is a supplementary spring which is said to be instantaneous in its action. It is claimed that these Springs are free to act in every way in conjunction with the leaf spring. The manufacturers state that



they not only allow the leaf spring free to perform the work for which it is designed, but that the Twin Springs assist them.

These springs can be quickly and easily applied in half an hour to any type of leaf spring and once they are adjusted, it is said that they never change their position. When ordering these springs be sure to state the make, model and year of the car, and whether it is two, five or seven passenger. It is also necessary to give the diameter of the spring bolt.

New Ever Ready Announcement

Nine new "special use" dry batteries, ranging from 2 to 15 cells, assembled in single moisture-proof or water-tight jackets with only two terminals to connect, and each battery named and labeled to show the use for which it is designed, are announced by the American Ever Ready Works, Long Island City, N. Y.

Recognizing its obligation to supply the public with accurate and scientific dry battery advice, the Ever Ready peo-

ple have spent several months in exhaustive research in this field.

And so to a famliy to which the eldest son—the Eveready flashlight—has already brought renown, nine new members have been added to take their place with Eveready Storage Batteries, Eveready Miniature Mazda Lamps, and Eveready Pocket and Dash Meters. Their names are Eveready Bell Ringer, Eveready Ford Ignition Battery, Eveready Gas Engine Battery, Eveready Tractor Battery, Eveready Lighting and Ignition Battery, and Eveready Marine Lighting and Ignition Battery.

The two cell Eveready Bell Ringer is the natural leader of the line. Here is a package of electricity in convenient form, ready to be hung on a nail or hook, its two terminals connected, and put to yeoman duty for door bells, annunciators, thermostats and burglar alarms.

Eveready Ford Ignition Battery and Eveready Ford Lighting Battery are in four and five cell moisture-proof construction respectively. The former is designed particularly for starting with crank; the later for lighting head lights and tail lights while the engine is at rest. The battery labels contain diagrams showing exactly how the batteries may be installed in a Ford car.

Eveready Gas Engine Battery and Eveready Tractor Battery have four and five cells respectively, also in moisture-proof construction, but with the cells in two rows. Either may be used for lighting one 2 c. p. lamp with the Eveready Portable Lighting Outfit, and the Tractor Battery is also adaptable for heavy duty bell, buzzer and annunciator work in large homes, apartment blildings, hotels and offices.

The Portable Lighting Battery has ten cells in two rows, also in moisture-proof case, and is designed for lighting two 2 c. p. lamps in camps, cottages, cellars, closets, garages, and all outbuildings.

There are three batteries in watertight cases which make them especially useful in wet places and for all marine work. Eveready Motor Boat Battery, Eveready Lighting and Ignition Battery and Eveready Marine Lighting and Ignition Battery have five, ten and fifteen cells in one, two and three rows respectively.

Comes Back to Shaler

W. R. Melcher formerly eastern representative of the Bemco Manufacturing Co., has returned to his first love, C. A. Shaler Co., Waupun, Wis., with whom he was associated during 1918-19.

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FOR FORD CARS

A Perfect Product for Particular People

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PARKING THE CAR

HOW DO you park your car? Though parking ordinances in cities differ they all require driving up to a curb of some kind. Right here many tire injuries are born. The motorist driving up at the proper angle unconsciously depends in a measure upon the curb stone to stop his car. Naturally the impact flattens and strains the tire carcass.

In driving parallel to the curb the tire side walls are ordinarily rasped against the stone. The edges of the tread suffer too. Of course the poorly inflated tire suffers the most as the resiliency of proper inflation is lacking. It is in this way, say Miller tire men, that rim flanges are bent.

Where the motorist drives almost head on against the curb, the carcass is bruised either near the middle of the tread or close up to the rim. Where the parking angle is sharper, the bruise is further to the side. The resultant roughened place on the inside of the carcass constantly chafes the tube. Such a condition is responsible for many a tube going flat without apparent reason.

A careful driver coasts to a stop, first throttling down his engine and applying his brakes gently. It is not necesssary to drag the wheels or bump the curb. The skillful driver is repaid in lessened depreciation and repair. The more reckless owner, however, can take comfort in the fact that such tire injuries are in almost every case repairable if taken in time.

Starting The Ford

By T. M. Earnhart, California: It never gets very cold here, but it sometimes is cold enough to make Fords cranky in starting. Instead of using hot water, hot clothes, etc. I hit on the following device for warming the intake manifold. I took about seven inches of heavy two-inch iron piping and drilled a hole on one side near one end so as to be able to insert a hooked wire for handling when hot.

Just before I am ready to start I place the piece of pipe over the gas flame (any other will answer as well) then set it upright on the floor board and tipped against the intake. In a short time the intake is quite warm and it is easy to start.

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With a "Yankee" Chain Drill you can drill safely with bits as small as 3-64".

No need to "nurse" the job like you do with an *ordinary* chain drill to keep from breaking small bits.

The Friction Feed runs the drill quickly down to work. Time saved!

Then the "Yankee" Ratchet Feed takes hold. Drill is fed steadily, rapidly and evenly through cut. Automatic, no hand feeding.

No. 1500. 3-Jaw Chuck for round shank drills up to ½ in. Length 9¼ in. Weight 3¼ lbs.

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Write for Free "Yankee" Tool Book.

Shows all the famous "Yankee" Tools in action and tells how they can help you. Here are some of them.

Ratchet Bench Drills
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"YANKEE" TOOLS
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A Battery as good as the best.

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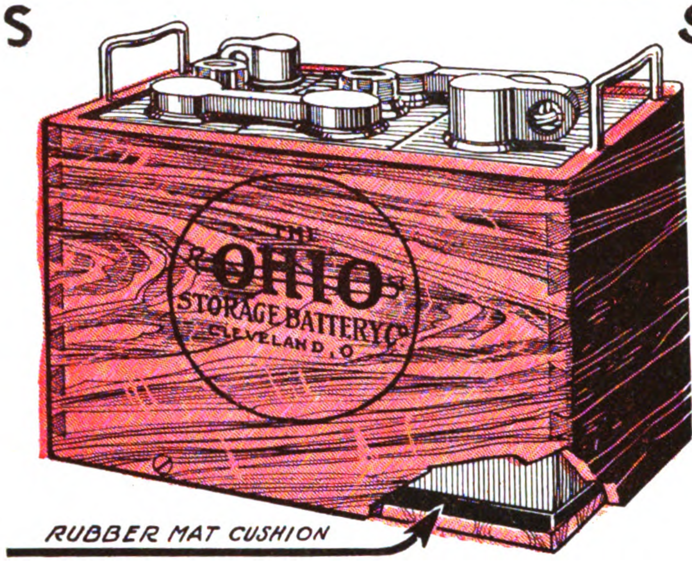

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Backed by a valid certificate of service

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With Exclusive Territory.

With dealers assisted by factory service and salesmen

is founded not on what the user puts into a battery in investment but on what he gets out in **service.**

This Battery is scientifically constructed. Natural wood finish case—one piece sides and ends, chemically treated so as to be acid proof. Unit cell construction —no compounds used in case—cover sealed on and individual cells easily removable—many other important service giving features including rubber cushions which eliminate breakage.

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In This Issue

OUR SPECIAL FORD NUMBER

MAY IS the month of blooms and flowers; it is the month in which Mr. Average Man leaves off his winter flannels and takes on a cargo of messy colds which lasts him until Summer puts an end to his misery. May is also the month in which Flivver blossoms mature and such being the case we intend to bring our Special Ford Number in that month. This issue will deal mostly with the care and repair of Ford cars and will be heralded by the Flivver enthusiasts in much the same spirit as the Spring seed catalogue is welcomed by some of our horticultural friends.

In our May issue we will endeavor to instruct you how to bring up your Ford car in the way it should go; how to train it so that it will be a credit to the family and the pride of the neighborhood; when and how to cater to its eccentricities; and how to tame it so that it will be your subject, rather than your master.

We have arranged for a number of special articles covering this popular car and relating to ignition, the electrical system and mechanical repairs. We will discuss many of the problems which continually puzzle the Ford owner; problems of carburetion, of cooling and of lubrication. For our dealer readers we will prepare an article relative to selling Ford parts and accessories.

As an automobile some people claim that the Ford is a failure, but as a means of locomotion everyone admits that the Ford car is a success, despite its peculiarities. There are those who admit that the ignition system is not of the best; those who claim many disadvantages for the fuel system; those who say that the Ford is prone to over-heat and those who say that the transmission and rear axle might be improved. Many of these same chronic kickers have tried to improve the design of the car and have failed so miserably that their products have helped to make the fortune of many junk dealers.

A Ford car is what you, Mr. Ford Car Owner, may make it. If you give it care and attention; understand its whims and use it as it should be used; then you will have no complaint to make. You cannot expect it to run without fuel, oil and water and for the same reason you must not expect it to run without proper attention. Read our next issue and learn what that attention should be.

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SPECIAL FORD NUMBER

Automobile Dealer and Repairer

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Entered as Second Class matter January 15, 1921 at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

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The outfit includes the vulcanizer—12 Patch-&-Heat Units (6 round for punctures, and 6 oblong for cuts) price complete $1.50. (Slightly higher west of the Rockies and in Canada.) Extra Patch-&-Heat Units 75c a dozen.

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Buyers' Guide and Index to Advertisements, Pages 78 and 79 Table of Contents will be found on Page 80

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Brake Lining for Ford Cars

has proven its worthiness; its economy; because it is wear-proof—its reliability; as efficient as an air-brake—its practicability; because it will not chatter or glaze and cannot be harmed by the hot, oily condition of the Planetary Transmission.

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Automobile Dealer and Repairer

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VOL. XXXI, No. 3 | MAY, 1921 | PRICE { 15c per Copy $1.50 per Year

FORD CARBURETION

I DOUBT if there is any subject which is so little understood by the car owner as that of "Carburetion" and its relation to the operation of the engine. Carburetion as a subject is broad enough to cover a very large field. The various phases of the subject might be discussed only generally and yet fill a large book. It is a subject which may be discussed from theory and from practice and the conclusions from the two discussions seem to disagree. As a matter of fact there are so many items to be considered in such a discussion that an actual, conclusive dicision is practcially impossible.

In this article we will endeavor to discuss the matter from a theoretical-practical viewpoint, if there is such a thing in the field of carburetion, and to apply the discussion mainly to the Ford car. We will also consider the various ramifications of carburetion as they affect the operation of the other engine units.

Gasoline, and we use the word to apply to all grades of the fuel commonly used in automobile engines, is not an explosive, in fact it is a relatively slow burning liquid. It is not in the class with the elements of the ethers or the benzines. It must be mixed with a certain volume of air to become an explosive and to form such a mixture it is necessary to vaporize the gasoline.

Although a mixture of gasoline vapor and air is fairly rapid burning it cannot be considered explosive in the strict sense of the word; another factor, compression, is needed. Not until gasoline is mixed with the correct proportion of air and ignited while it is under a certain pressure is the gas explosive. The proportions of air and gasoline and the amount of compression or pressure above atmosphere are all items which tend to increase or decrease the force of the explosion. For the sake of simplicity we will divide the theoretical discussion into two items and consider, first, the mixture and second the compression.

It has been found by many carefully conducted experiments that the most powerful explosive mixture consists of from 14 to 15 parts of air to one part of gasoline, by weight. A statement of this fact by volume would show from 25 to 30 parts of air to one part of gasoline. A gasoline-air mixture of as low as 17 parts of air to one part of gasoline, by weight, is effectual. In other words the effectual explosive mixture for extreme power is 15 to 1 and for economy 17 to 1, by weight. It is the function of the carburetor to form this mixture.

We have shown the proportions of fuel and air for maximum power and maximum economy as being between 15 and 17 to one. The operating conditions decide the proper mixture. One factor entering into this is the speed of the engine. At low engine speeds the mixture must be rich in gasoline while the mixture may be diluted with air as the engine is speeded. The best carburetors on the market take care of these varying mixtures.

A mixture which will give maximum power at low engine speeds does not seem to give maximum power at high engine speeds and since the carburetor furnished with the Ford car is of the constant mixture type, it cannot be adjusted correctly for maximum power at all speeds; nor can it be adjusted for maximum efficiency.

A Homogeneous Mixture

The reader will note that we speak of a gasoline-air "mixture" and such a thing is purely theoretical. It is practically impossible to obtain a homogeneous mixture of fuel and air in the explosion chamber. We will consider conditions and see just why such a thing is a theory and not a possibility in practice.

Fill a glass vessel with a mixture of gasoline and water and allow the mixture to rest for a few minutes. You will find that the water collects at the bottom in a short time and there is a sharp dividing line between it and the gasoline. Stir it violently and it will mix, after a fashion, but upon coming to rest it separates as before. If you were to reduce the temperature of the mixture to

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near that of the freezing point of the water, (32 degrees F.), you would find that the separation of the two liquids would be more rapid after they were allowed to come to rest.

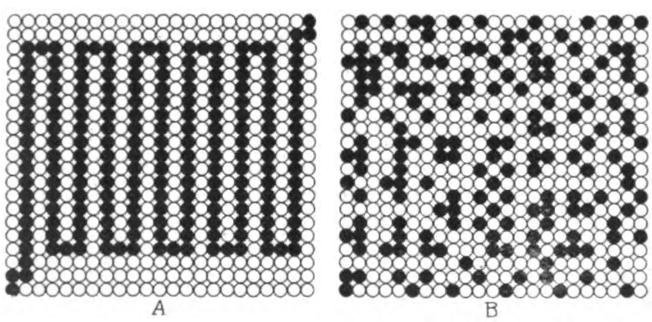
In a measure the case is parallel to that of a gasoline-air mixture. Gasoline vapor in this case would take the place of the water, while the air might be likened to the gasoline in our example. If gasoline vapor and air are mixed and the mixture is cooled, then the gasoline vapor condenses and separates from the air. A liquid and a gas will not mix. Either the liquid must be changed to a gas, or the gas to a liquid, or there can be no mixture. Obviously, then the more completely the gasoline is gasified, the better the mixture.

Let us assume for a minute that it might be possible to gasify the fuel completely in the carburetor and to form an ideal mixture of 15 to 1 in the carburetor. Such an ideal mixture would be homegeneous. That is to say the particles of gas from the fuel would be evenly mixed and distributed among the particles of air.

Condensation of the Fuel

From the carburetor such an ideal mixture would pass into the manifold before it reached the engine. (Remember we are considering the Ford engine in this case.) The Ford manifold from valve ports to carburetor is over 12 inches in length. If the manifold were cold, or below the temperature of the carburetor, then that portion of our ideal gas mixture which came in contact with the manifold would be chilled and the gasoline would be condensed. Under this condition the mixture would cease to be homogeneous and become a volume of air with drops of gasoline floating around in it. Such a mixture would be rapid burning, perhaps explosive, but would not give maximum power.

To make this more clear let us consider a train of powder along a surface. So long as every little particle of powder touches the one next to it, it will all ignite if

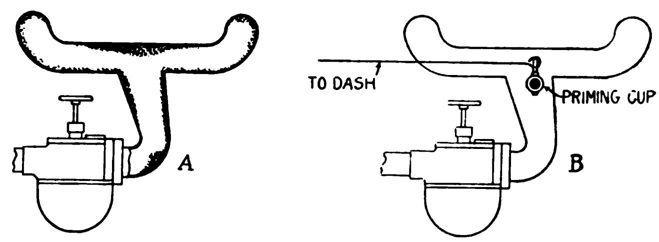


With an Ideal Mixture as Shown at A, the Fire Would Travel Throughout the Fuel but in a Mixture as Shown at B, Only Part of the Fuel Would Be Consumed.

a spark is started at one end. Break the train at some point and the flame will not pass over the break. A poorly mixed body of gasoline drops and air is much like the train of powder, an isolated drop of gasoline does not ignite and therefore is wasted. A homogeneous mixture will ignite throughout. If the mixture is poor, then more gasoline is required to fill up the openings between the drops and to give the requisite power.

Let us revert to the case of the water and gasoline mixture. In this case we found that by violent agitation we could make such a mixture, but that it would quickly settle into its component parts as soon as the agitation ceased. There is an interval of minutes before the water and gasoline finally settles. During this interval there is a fair mixture. But suppose either water or gasoline were added. If water were added it would drop to the bottom immediately, it would not mix unless the mixture were again agitated. If gasoline were added it would simply remain on top. We can consider the gasoline-air mixture entering the engine as a parallel case.

After the carburetor has mixed the gasoline and air the result may be considered as a finished mixture. If air is added it does not mix with the original mixture but simply passes into the engine with the mixture. If fuel is added it either condenses or enters the engine in the form of liquid drops. The carburetor should do all



At A is Illustrated the Condensation of Fuel. At B is Suggested an Air Inlet Device for Saving Fuel.

of the mixing if it is to be considered as an efficient device. The Ford carburetor, unfortunately, as we have explained is a constant mixture device. It is made to take care of "average" conditions and in comparison with its price it acts commendably.

If the mixture is fairly good when it leaves the carburetor, and we consider that the Ford carburetor mixture averages to be fairly good, no more air should be added unless that air can be mixed with the gasoline-air mixture properly. Leaks in the intake line, around the valve stems, past the pistons or the spark plugs result in poor engine action simply because the rule of carburetion is broken. Such leaks may result in excellent engine action at high speeds but poor action at low speeds. When the engine is operating at high speeds the air is drawn through the leaking parts and the mixture is agitated enough to mix it with this excess air, but since this leakage cannot be adjusted or controlled it is highly unsatisfactory.

A device which will permit air to enter the manifold under certain conditions makes for greater economy and is to be recommended. But such a device should be so adjusted that the air may be controlled, either manually or automatically.

This gives us enough theory along these lines for the time and we can now consider the whole subject of mixtures and carburetion from the practical side. "What are the faults of the Ford carburetion system?" and, "How can these faults be remedied?", are the two pertinent question which we will now try to answer.

The Ford carburetor and we speak of either the Holley or the Kingston, is the simplest type of carburetor

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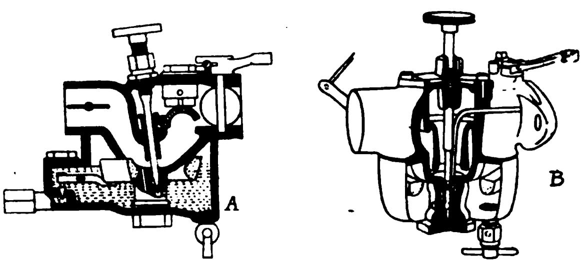
designed. It consists of an air intake which permits the air to pass across a spray of gasoline, when the engine is running at a fair rate of speed, and over a puddle of gasoline at lower speeds. When the engine is running at very low speeds, on a Kingston carburetor, the air supply is largely cut off and a large excess of fuel is fed into the cylinders.

Such a carburetor depends for action upon the speed of the air passing through it. At high speeds the mixture is fairly good because the vacuum tends to break up the spray into a fine vapor. It should be clear that there is a certain "economy" and a certain "power" adjustment for various engine speeds. That is to say it is possible to adjust the device for either economy or power at low speeds but the engine will not operate at the same adjustment for economy or power as the case may be, at higher speeds.

As a general rule the adjustment should be made for "economy" at low speeds and as the engine speeds up it automatically takes a greater proportion of gasoline to air, thus giving a "power" adjustment.

If the adjustment were made for "economy" at high speeds the engine would not run at low speeds because the proportion of gasoline to air would be too small.



The Kingston Carburetor is Shown at A and the Holley at B; Both Being In Cross Section.

To adjust the carburetor on a Ford car, in order to get the best results, when the car is used for ordinary passenger service, the needle valve should be turned down just as far as possible without stopping the engine. The engine at this time should be running idle. A careful operator will pay just as much attention to the needle valve adjustment as he does to the throttle or the spark, because he realizes that such attention results in the saving of fuel.

By adopting such a procedure the driver may be able to save as much as three miles, or even more, per gallon of fuel. The driver starts his machine on a journey and at first, when running slowly, the engine requires, for instance, a full turn of the needle valve. After the engine has warmed he can turn the needle valve backward from ⅛ to ¼ of a turn. If he is running at from 25 to 30 miles an hour along level roads or down grades he can turn the needle valve back nearly half a turn. As soon as he throws out his clutch or slows down the machine, however, he must open the needle valve again or the machine will stall.

The writer would suggest that every Ford car be equipped either with a needle valve adjustment on the steering column, or an air valve adjustment. It is an easy matter to install either of these adjustments on the steering column. Remove the regular dash-needle valve adjustment and fit the carburetor adjusting screw with a long arm. Connect this arm with an L shaped fitting to a similar fitting on the dash. Carry a wire from this latter fitting to a second one located near to the steering column and run a stiff wire up, alongside the steering column. If the linkage is correctly made a pull upon the steering column wire will open the valve from ½ to a full turn. Conversely a push upon the wire will close the valve a similar amount. The operator may control the needle valve in this way just as easily as he does the hand throttle.

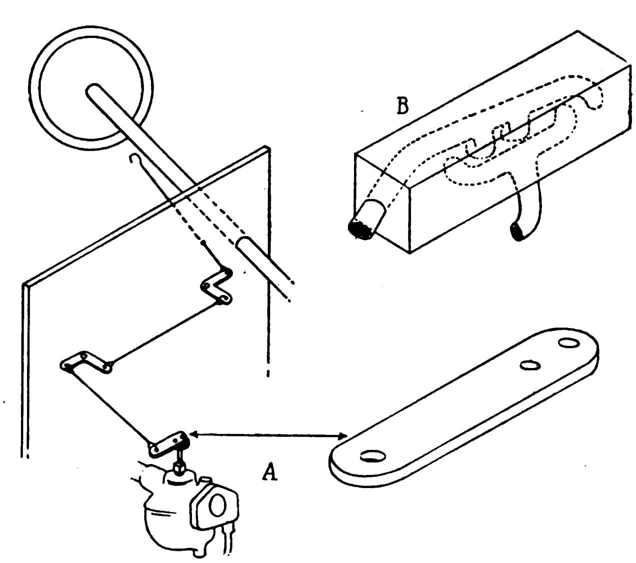
An Auxiliary Air Device

In a similar way an air petcock on the intake manifold, just below where that member branches, may be controlled. At high engine speeds the operator may admit air to the intake and cut it off when more power is required or the engine speed drops.

Either of these fittings, properly installed and properly managed, will save fuel. A Ford car which normally gives 15 miles to a gallon will give from 19 to 20 with such a fitting. A Ford which runs more economically on the average and gives from 19 to 20 miles can be operated at from 23 to 25 miles on a gallon with such a fitting.

Do not blame the carburetor, always, it may not be at fault. For the past ten or more years the Ford car has been equipped with either Holley or Kingston carburetors. This equipment has given satisfaction. It is fair to say that the average Ford car will operate from 20 to 25 miles on a gallon of fuel if the engine is mechanically in good condition. If this equipment will give these results on an average car it is fair to assume that it should give similar results on your machine. Carburetors are made from patterns, in jigs and there is no such a thing as a "lemon," they are all too near alike.

We now come to the point of considering "condensation." We have found that we might have an ideal, homogeneous mixture from the carburetor and yet not



At A is Shown a Method for Controlling the Needle Valve. At B is Suggested a Combination Stove for the Manifolds.

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get the same kind of a mixture in the cylinders. The temperature of the carburetor, the intake manifold, and the cylinder block must be the same or the mixture will change after it leaves the carburetor. Any reasonable amount of heat applied to the manifold or the block will result in a more homogeneous mixture. For this reason we have many different types of "hot spot" manifolds and so on.

The Ford owner will do well to consider this subject, it is vitally important. Condensation results in an unevenly acting engine. The remedy is easy to find and easy to apply. Simply build a sheet iron box which will fit over the intake and exhaust manifolds and shield them from the breeze from the fan. The writer recalls the case of one Ford car in particular which illustrates the point he wishes to make.

A Peculiar Condition

The Ford car in question had a number of interesting tricks. When first started it would kick and cough like a mule in the last stages of consumption. It would not operate on four cylinders, or even three, until it had been run from 15 to 20 minutes; then it would operate without a single skip so long as the car speed did not exceed 15 miles an hour. Over that speed, however, it would begin to skip again, *unless the spark lever was retarded.* If the hood were opened to find the trouble, the trouble was always there to find. It would not run evenly if the hood were open.

When the answer was found the puzzle was laughably simple. The engine would run smoothly as long as the exhaust manifold was red hot; hot enough to warm the intake manifold. As soon as the car speed was high enough to cool off the engine, it would begin to skip. If the spark were retarded the exhaust manifold, naturally, would overheat and it would run evenly again.

And the Cure

We cured the trouble very quickly by placing a baffle plate at the front of the engine so that the breeze from the fan did not blow against the manifolds or the carburetor.

An application of heat to the mixture between the carburetor and the engine is far more satisfactory than a hot air stove on the carburetor air intake. The latter simply heats the entering air and expands it, thus reducing the volume and the efficiency of the engine. Naturally the exact size of a manifold stove depends upon the car. Some engines do not need such a stove, others do. Such a device cannot damage the engine so long as the exhaust manifold does not overheat or operate at a red heat.

We now come to the matter of compression, which really should be considered in any article on carburetion because without compression, a fully carbureted mixture will not explode.

You may install the best and most expensive carburetor made on your car and if the cylinders are not gas tight, then the engine will not operate satisfactorily. Compression is as essential as ignition. Factors which make for poor compression are leaky valves, leaks in the plugs, leaks in the cylinder head and leakage past the pistons.

Every Ford owner should test the compression of his machine occasionally. An ordinary gauge which will show pounds per square inch will suffice if it can be attached to the cylinder in place of the spark plug or priming cup.

If the gauge shows 50 pounds per square inch, then the engine is below normal but will give a fair amount of power. If the gauge shows over 70 pounds the compression is too high and the engine will probably knock. A high compression indicates excessive carbon and the carbon should be removed. Such a condition is exceptional. If the gauge indicates 55-60 or even 65 pounds the engine should operate satisfactorily. (This applies to Ford cars.)

One can easily see that, if the compression is good in three cylinders and poor in the fourth, the engine will operate unevenly. A well balanced engine will show approximately the same compression in all cylinders.

To sum up the whole proposition of carburetion we might say that an engine will operate satisfactorily if the gas mixture is kept at an even temperature, equal to or above that of the carburetor and is well compressed before firing. Under these conditions the engine will operate with more snap and run cooler than under any others.

Only a Superstition

It is a mistaken superstition that an engine runs hotter if the ingoing air is warmed. It might be true if the heat did not add to the "dividing up" of the mixture, but a homogeneous mixture will give a good explosion and it will all burn at a time. If the mixture is poor, however, it will continue to burn after the exhaust valve has opened and the heat will be carried through the exhaust passages where the cooling medium cannot absorb the heat so readily.

If your Ford car has been giving you trouble, do not jump at the conclusion that the carburetor is at fault but examine the conditions and follow our recommendations first before discarding a carburetor which might give satisfaction if given a fair chance to do so.

GRAVEYARD COMEDY

Lies slumbering here
  One William Lake;
He heard the bell,
  But had no brake.

At fifty miles
  Drove Ollie Pidd;
He thought he wouldn't
  Skid, but did.

At ninety miles
  Drove Edwards Shawn;
The motor stopped,
  But Ed kept on.

Driver Dan.

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Selling Ford Accessories

A Field of Unlimited Possibilities Yet Requiring Careful Salesmanship

IN our last issue, by way of announcement, the editor stated that we would tell our dealer readers how to sell Ford accessories. I trust that no one has the idea that we have some wonderful selling plan to divulge and that the almost bankrupt dealer can, after reading this article, blossom forth as the town's leading capitalist. We have nothing like that for publication but we are in a position to furnish a number of practical ideas which, if worked out properly, will result in increased business.

Local conditions will modify or render useless a general set of rules for selling accessories. The subject calls for theoretical discussion because local conditions make practical discussion without any sound basis. But when it comes to selling Ford accessories the problem is as different as that of computing the area of a square as compared with that of a circle.

The Ford car, and we may say this without prejudice, is the best known machine made. In every town from Portland, Maine, to Los Angeles, California, there is a repair shop where crippled Fords may be cured, or at least one man who understands the machine. Ford cars are as much of a fact as population.

The Ford car has become a national institution. Ask a man what is America's national flower and he probably will hesitate between rag-weed, dandelions and roses but ask him what the Nation's car is and his answer will be given before you can get your mouth closed. Children learn to spell Ford before they know their alphabet and I am told that if Ford lives long enough, babies will learn to say his name even before they are old enough to lisp "Ma" or "Pa."

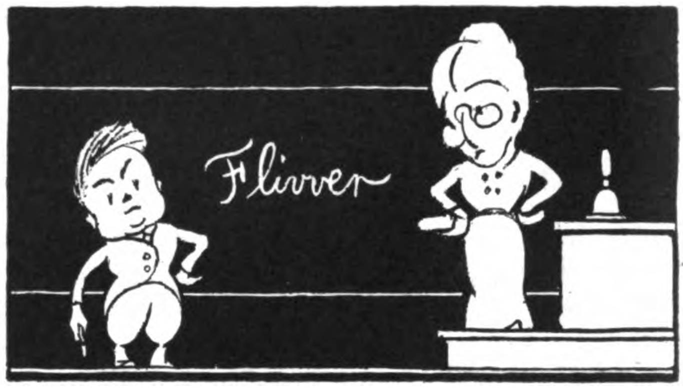
With such a condition, with Fords as thick as flies, it would seem that the selling of Ford accessories were reduced to the mere details of taking in the money and passing out the goods. Unfortunately, from the dealer's standpoint, this is not the case.

A Wide Field

The field is there, there are plenty of customers, there are plenty of accessories and the dealers are anxious to sell, but there is a missing link in the chain. The proportion of sales to Ford owners is far below that which it should be. Why? I shall try, in my humble way, to answer this question.

In attacking the problem we must first understand conditions. First, who are the prospects? It is to be assumed that every Ford owner is on the market for some sort of an accessory. The car is a complete unit for transportation, as it comes from the factory, but there are few Ford owners who will be content with the ordinary equipment. But there is always a chance for improvement.

The hobby of every Ford owner is his car. If you find that your companion on the train is a Ford owner you can immediately begin a Ford "talkfest" that can be prolonged indefinitely. It follows, then, that every Ford owner is a prospect for accessories which will improve the appearance or the operation of his car.



Children Learn to Spell *Ford* Before They Know Their Alphabet.

This big field of prospects may be divided into two classes; those whose pocketbooks are fat enough to enable them to indulge their hobby and those whose income is large enough only to buy necessities. To sell both classes of customers requires an entirely different method of publicity. From my experience I have come to the conclusion that the average accessory advertising and publicity is directed toward the smaller of the two groups of customers, those who have the money. And I think I know the reason why this condition exists. The manager of the accessory store finds it easy to sell accessories to the men who have money to spend. He comes in contact with this class and soon learns to give them certain arguments in favor of the goods. He tells them how certain accessories improve the appearance of the Ford car, how the riding qualities are increased. He learns to sell his products as luxuries, not as necessities. His advertising and publicity is directed along these lines, his show windows carry the same suggestions. There comes a time when he caters entirely to this class and believes that this class constitutes the majority of his prospective customers.

I have said that the majority of prospective Ford accessory buyers comprises the poorer class. Perhaps this statement deserves some comment. A man buys a Ford car mainly because this car falls within the reach of his pocket book. Perhaps he needs a cheap car in his business, or possibly he prefers the car for pleasure pur-

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poses, but in the majority of cases, having invested his money, he does not care particularly for luxurious fittings. The machine runs with the original equipment, it "gets him there" with the minimum amount of comfort consistent with his investment and his cash account compels him to be satisfied.

In many cases people who own Ford cars are in no position to put out any more money unless that money is expended as an investment. And so it is safe to assume that the majority of Ford owners are not looking for accessories simply for the pleasure of spending money on them. They are alert for accessories which will yield dividends in the shape of economical running.

During the past four or five years it has been my privilege to receive the correspondence in the "Trouble Department" of this and other magazines. This experience has been valuable in that it has shown me the weaknesses of cars and the general feeling of the motoring public toward the automobile as a machine. Incidentally I have gained many ideas as to the value and demand for accessories. In this article I am passing along some of these ideas.

Every day I receive hosts of inquiries as to certain types of accessories. The general tenor of such questions is toward economy. "Will such an accessory save me money?" is usually the big question.

Why is it that the accessory salesman and the store owner do not answer these questions themselves? Is it not their own business to do this?

If the accessory salesman is in a position to prove that a certain accessory will save the customer money, then he is in a position to sell the product. But the customer, not having money to throw away, usually wants to be shown. He wants a guaranteed saving, not a theory.

Let us consider a concrete instance. You are selling a carburetor which you are confident will average to save

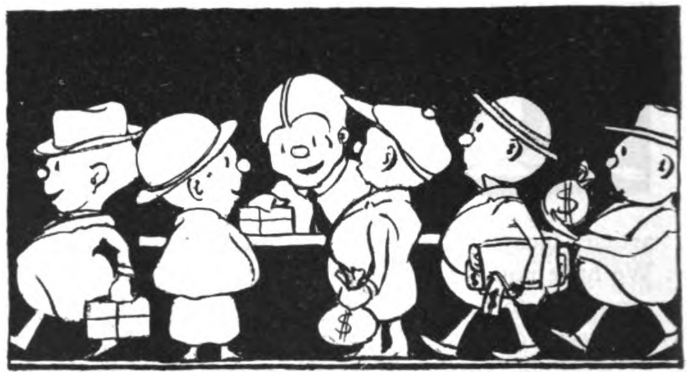
Fords are Almost as Thick as Flies.

five miles on a gallon of fuel when used on a Ford car ordinarily giving 15 miles to the gallon. (I have found that the average Ford car gives this mileage, when taking into consideration all of the Fords in use to-day.)

The average owner will operate his machine for 5000 miles in a year which means, at 15 miles to the gallon, 250 gallons of gasoline. With gasoline selling at 30 cents this means a total cost of $75 a year for fuel. Your carburetor will save approximately 25% or $19 a year. No doubt it will practically pay for itself the first year.

You may be sure of these facts and it is only necessary that you prove them to the prospect to make him a customer.

The ordinary salesman would talk up the improvement in the operation of the car. He would tell the customer how easily the engine started with this carburetor and would only mention the actual saving as an incident. His



It is Not a Matter of Taking in the Money and Passing Out the Goods.

arguments would be effective in selling to the man who had the money to spend, the man who was looking for a "luxury" but would only result in a "you've got to show me" attitude on the part of the fellow who counts every penny he spends as an investment.

Well, why not show him? Equip a Ford car with one of these carburetors, drive it over a certain specified route under good conditions and offer a prize to any Ford owner who might be able to show more economy with his make of carburetor.

I can seem to see a number of my dealer readers raise their brows at this suggestion. "Suppose we do this," they say, "and we cannot make a good mileage record, then we cannot sell the carburetor to anyone."

Personally, if I were a car owner and knew that my favorite accessory salesmanager took that attitude, I would shun his place as I would a robber's den. You may be in business to sell accessories but you surely are not running a shop to sell worthless things. There is but one attitude to take in such a position as discussed in the previous paragraph and that is to discard such lines as you know will not give your customers satisfaction.

The sound basis for good business, a basis upon which you can keep a clientele of patrons, is trust. And by this I don't mean credit, I mean faith in your products. "If you are not satisfied with anything you buy here, bring it back and we will refund your money," is a slogan which has made the fortune of many a merchant. I might also mention the fact that it has wrecked almost as many, as well.

If correctly worked, a "refund your money if not satisfied" policy is the best way to gain the confidence of your customers but the merchant must watch his step all of the time. The merchant must be in a position to know that the stuff he is selling *is* satisfactory.

To my mind the cheapest way to find out whether the goods you are selling *are* satisfactory or not is to try

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them yourself. For this reason I have suggested my plan for selling Ford accessories. Keep a Ford car at the disposal of your customers. Give accessory exhibition tests from time to time and show the people what these things will do.

"Let us install our special, 'Economy' carburetor on your car and prove that it will save fuel. If we cannot show a saving on your car we will put back the old equipment and it won't cost you a cent." There is no reason why his statement will not sell carburetors for you, if the carburetors will do the work.

At first it will cost you all of the profits to install the carburetors as soon as you have made a few installations the carburetors will speak for themselves and your troubles will decrease until there will come a time when the devices will sell on their merits and your customers will not need to be shown. I will have more to say on this subject in a future article, however.

In selling Ford accessories the confidence of your patrons is essential; more necessary than in selling any other class simply because, as we have said, the average Ford owner has not the money to spend carelessly. "Show your prospect that an accessory will save him money and he will buy it," is an excellent rule, it is the first one to observe and follow.

The second point I wish to make, and a very important one I find by experience is that the average Ford owner is afraid of a new accessory, or rather, afraid of what the product will do to his car. Let me illustrate this by two examples, a product in the first case and an accessory in the second.

I recall a letter, from one of the readers of this magazine, which I received a short time ago. This reader wanted to know all about a certain kind of liquid carbon remover. He said that his friends warned him against the use of any liquid carbon remover, that such a product would surely damage the cylinders beyond repair. The man himself was in favor of carbon remover but did not care to act against the advice of his friends.

Overcoming Prejudices

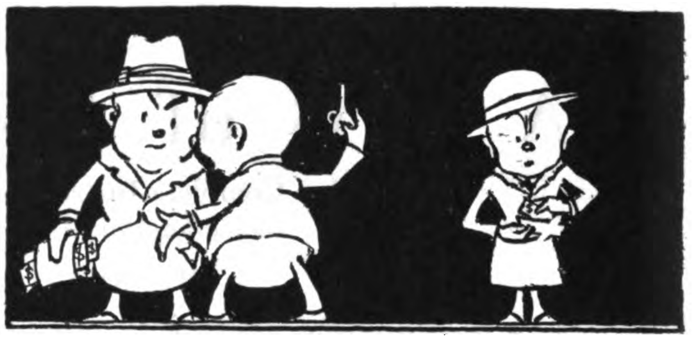
This was not a case of being shown what the product would do. It is to be assumed that the man knew that the carbon remover really would remove carbon. He simply wanted to know if the chemical would remove the engine with the carbon and if the remedy was worse than the disease he didn't want to use it. This man's case is a typical one and shows what prejudices must be overcome by the accessory salesman who tries to market a liquid, carbon-removing product.

The same question has come up many times in the case of water-vapor attachments. "Water rusts iron—why doesn't it rust the cylinders in my engine? If it does, then why damage the engine?"

The answer to both of these questions is an easy one. If either carbon remover or water is used in an engine while the latter is in operation; or if the engine is operated soon after the use of either of these two liquids; then no damage can possibly result because the lubricant, the heat and the fuel all combine to drive off the liquids and within a few minutes the cylinders are in exactly the same condition as before the liquids are applied. As a matter of fact, though it is not advisable to try it, I doubt if there is a single acid which will damage the inside of an engine, provided that engine is operated shortly after the acid is applied.

Suppose you exhibit in your show window a glass of carbon remover in which is placed a piece of polished iron and a piece of brass. Prove to your patrons that the carbon remover will not damage either metal. Do you think that any argument could be more conclusive than such an exhibit? I doubt it.

If you wish to convince the customer that water doesn't have a chance to corrode the cylinders simply



The Prospects are Divided into Two Classes—Those With Money and Those Without.

place an electric grill or heating plate in your window and over it place a dish of water with a syphon arrangement which will let the water fall, slowly, in drops upon the hot plate. The water will hardly hit the plate before it is converted to steam and there is no visible effect upon the plate itself. A window card with the inscription, "What happens to water when it reaches the cylinders" will explain matters.

My second example is the case of the man who is told by his friends and others that oversized tires are a delusion. That oversized tires are heavier than ordinary tires and therefore he is adding to the unsprung weight of his car. His friends, and others, probably tell him all about unsprung weight and so on until he shuns oversized tires. When you try to show him a saving in mileage and money he won't even listen to you.

There are many of such superstitions going the rounds and you must carry on a campaign of education before you can expect to sell goods. You can't overcome the argument that unsprung weight is increased by heavier tires but you can show him that too great stress is being laid upon this factor. Take the man literally at his statements and show him why he should throw away the wheels, the tires, the tubes and even the axles themselves if he wishes to eliminate all unsprung weight. Show him that the proportion of added weight in oversized tires is negligible as compared with the total and he probably will forget all about "unsprung weight."

I would make one final suggestion to every accessory salesman. In selling Ford accessories be sure to make the point, if possible, that the purchaser may attach the accessory without disturbing the other parts or the opera-

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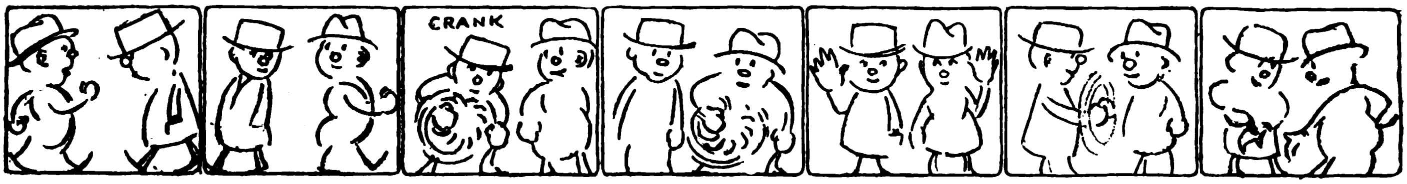
tion of his machine. If he is not satisfied he may take off the accessory and return it and his Ford car will be in the exact condition as before. In other words he has absolutely nothing to lose.

Your clerks should know the stock which they sell and be able to speak with authority. Directions furnished by the manufacturers are often inadequate and the customer is often dissatisfied because he has not been able to apply the accessory properly. Before taking back an accessory make sure that the customer has given it a fair trial and that he has applied it to his car correctly.

If you will bear in mind the one fact that your Ford car customers are "from Missouri" and "show them why and how" you will be able to sell Ford accessories.



When Ford Owners Meet They Immediately Begin a Ford Talkfest that Can Be Prolonged Indefinitely.

A B C of the Automobile

Complete Instructions Which Enable One to Understand the Ford Wiring Diagram

By Robert A. Chandler, S. A. E.

FIGURE 1 shows the Ford standard starting, lighting, and ignition system as printed in the Ford handbook, Cut No. 27. Fig. 2 shows the same system in a clearer form and one much easier to trace out. Although the diagram is laid out differently the parts will be found approximately in the same positions that they occupy on the car. Wires of different colors are used throughout, making it an easy system to study.

There is one mistake in the Ford diagram which has been corrected in Fig. 2. The headlight wires at the terminal block are stated to be gray to light bulb and brown to dim terminal, but are reversed at the headlights. An actual inspection of the wiring system will show that the brown wire connects with the light bulb

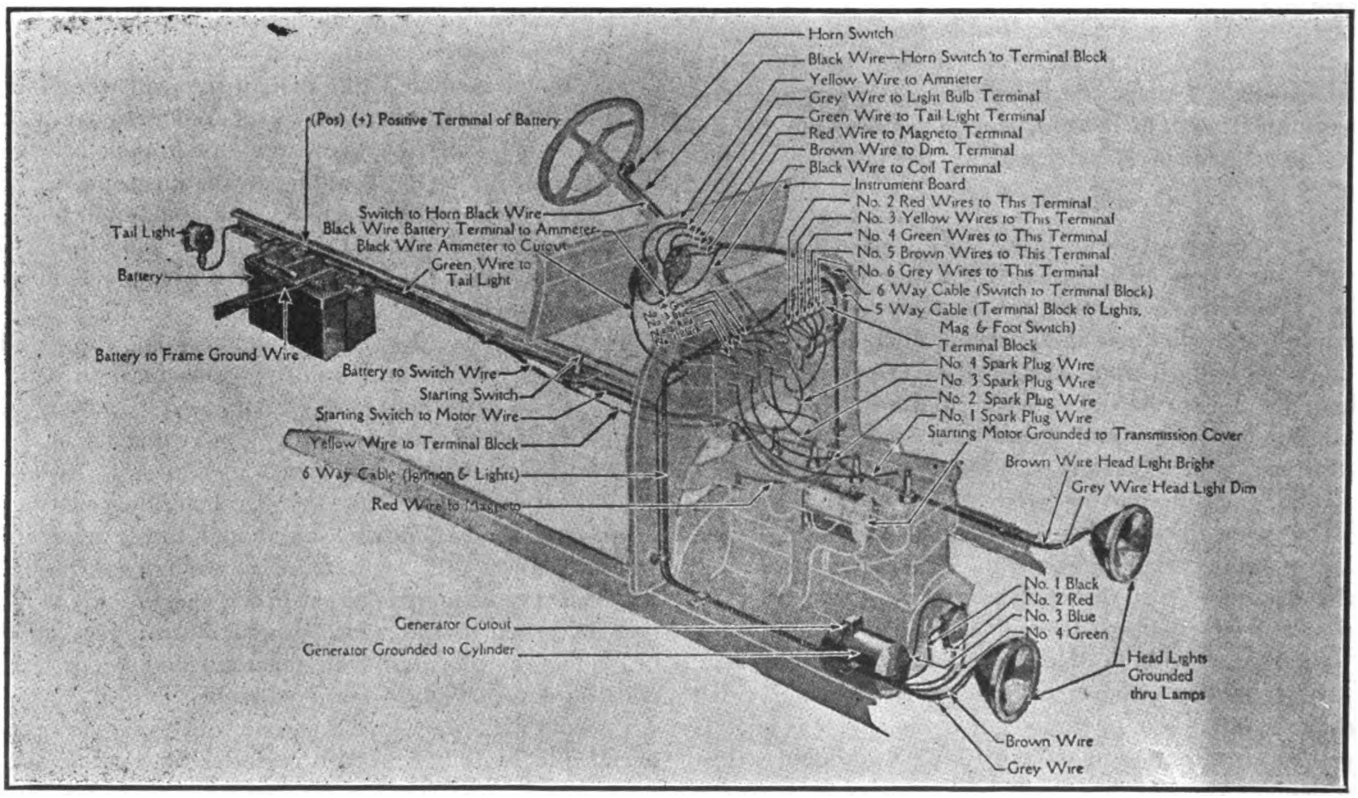


Fig. 1.

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and that the gray wire is for the side or dim connection.

Taking up the charging plant first: the current is made in the generator, which is grounded to the frame of the car so that the current can return to the generator without the use of an extra wire. It then passes up to the cut-out, which is now mounted on the generator, but which used to be fastened on the dash.

This is an electrical valve, so to speak, which allows current to pass from the generator to the battery but does not allow it to return as this might discharge the battery or burn out the windings of the generator. The current now passes through the ammeter which informs the operator that the battery is being charged and at what rate.

We can now trace its path over the yellow wire to the terminal block, over another yellow wire to the starting switch. The current does not pass through the starting switch but follows the heavy starter cable to the positive of the storage battery. It enters at the positive so as to charge the battery and leaves at the negative, going to ground (the frame of the car) and so back to the generator.

Current for Ignition

When the current is needed for the ignition or the lights it starts from the positive of the battery, runs over the heavy cable, then along the yellow wire, past the terminal block and through the ammeter. It then passes from the ammeter over the black wire to the battery terminal on the back of the switch. This terminal supplies current to both switches, the inside one (operated by a key) being for the ignition and the outside one for the lights.

According as the switch arm is swung to one side or the other it gives a bright or a dim light. The current for the bright light passes out of the terminal marked "Head" and follows the brown wire to the terminal block. Here the wire branches so as to feed both headlights. The current is grounded at each light and returns to the battery through the frame.

If the dim light is used the current passes out of the top terminal marked "Side" and follows the gray wire to the terminal block where it branches in the same manner as the brown wire.

Current for Tail light

The tail light receives current whenever the headlights are used, a green wire being used for this circuit. A red wire is used for the magneto connection and a black one for the horn, as shown. Note that the ground terminal on the switch is not used.

When the ignition switch makes contact the current leaves by the coil terminal in the center, passes over the black wire to the terminal on the coil box. It passes through the primary windings of the coils, as required, through the vibrators, and then to the timer, where it grounds and returns to the negative of the battery. When the current passes through the primary winding of an induction coil it makes a high tension current in the secondary winding.

This leaves the coil by the lower contact and passes to the spark plug. Note that the plugs are wired up 1 to 1, 2 to 2, 3 to 3, and 4 to 4, but that the timer is wired up in the firing order, 1-2-4-3. If we start with the No. 1 or black wire on the timer and pass round to the left as indicated by the arrow we shall meet the wires in that order. The roller inside revolves in that direction and so fires the cylinders in the proper manner.

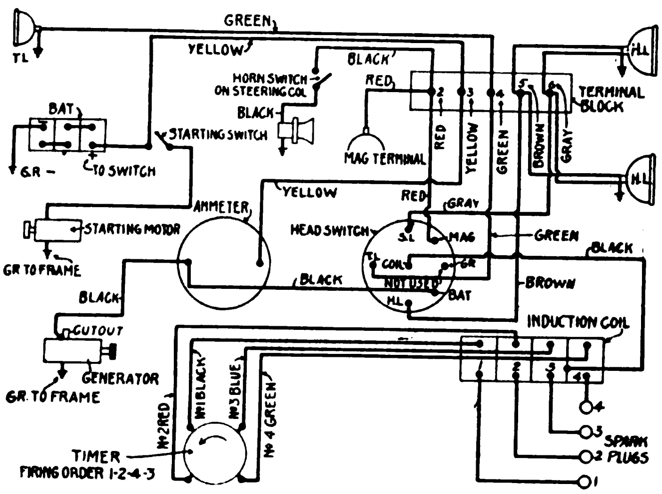

Fig. 2

The starting circuit is the simplest one of all. The current leaves the positive of the battery, passes over the heavy cable, through the switch and enters the starting motor. It then grounds, running along the side member of the frame and returns by the ground wire to the negative of the battery.

If the beginner will study thes diagrams carefully and then trace out each wire on the car or on a chassis at some Ford agency he will have but little trouble in understanding the whole system.

WHY SHE LEFT

A fussy bachelor engaged a cook, whose professional skill was conspicuous by its absence. He bore up bravely for one dyspeptic month against her culinary experiments. Then he hinted that her talents were wasted upon him and she departed.

Shortly afterward she applied to him for a reference. He gave it thus:

"Mrs. Muggins was employed by me for one month as cook. Left on account of illness—my illness."

Advertising is stating who you are, where you are, and what you have to offer the world in the way of commodity or service. And the only man who should not advertise is the one who has nothing to offer.

It is better to hook a few small ones than never fish at all.

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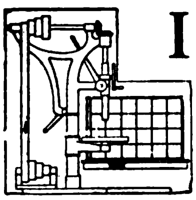
Such a tool is useful in dealing with screw heads, which are in such close proximity to other parts so as not to admit the length of the ordinary screwdriver. This tool may be made from an old discarded file, heating the file to a dull red and then bending it at right angles to the length. The edge should then be ground off to a thickness suitable for the size of screw for which it is to be used.

The Use of Grinding Wheels

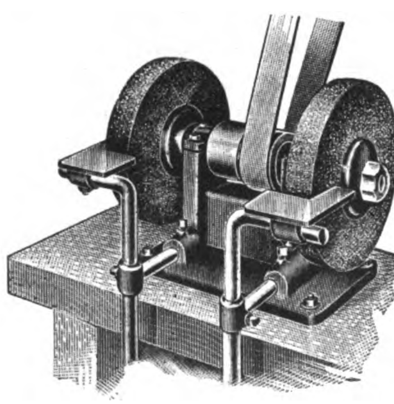
The Various Types of Grinding Wheels: Their Composition, and How to Use Them

By J. F. SPRINGER



IN THE ordinary repair shop, the grinding wheel is a very serviceable tool. By it may be performed certain necessary operations that could only be carried out with great difficulty with another tool or could even not be carried out at all by any other means. I speak now only of simple grinding operations in which the hand is the holding device or a large part of it and not of what may be termed precision grinding. The grinding wheel properly made and properly operated is a cutting tool that will cut what other cutting tools refuse to cut.

For example, a cast-iron pipe or other object has been broken and the oxy-acetylene process has been applied to make a repair weld. In the course of this work, the silicon in some of the cast iron is lost in some way and this metal in consequence takes on a different character. In fact, a ridge or a region of *white iron* is formed; this will be very hard—so hard in fact as to make it difficult to cut the material. Here is where the grinding wheel comes in. The work may be held up to the rapidly rotating wheel and get its rough surfaces and projecting edges ground off. Again, tools such as cold chisels and the like, need to be ground, after they have been forged and hardened, in order that just the right edge may be shaped.



Conventional Type of Bench Grinder with Two Wheels for Roughing and Finishing

In short, a good grinding machine is a very useful thing around a shop.

There are several styles. One form provides for two grinding wheels. These are secured at the two ends of a long spindle. There are two journal boxes set wide apart, the grinding wheels being on the projecting ends of the spindle. Two small pulleys are mounted half way between the wheels. One pulley is smaller than the other. The object in having two is to get a change of speed by simply shifting the belt from one to the other. For example, when a grinding wheel is first put on the machine, it should ordinarily be rotated at a less number of turns per minute than is proper and perhaps necessary later on. Accordingly, one first puts the belt on the bigger pulley and later on, when the wheel has been worn down, changes to the companion pulley.

The usual grinding wheel consists of two principal parts—(1) the *abrasive material* in the shape of grains that are exceedingly hard, and (2) of the *binding material* which holds the small grains. The small grains are really little cutting tools. It is a matter of considerable importance that the proper size of the abrasive material be selected so as to suit the work, and that the holding material have the proper degree of softness.

High Peripheral Speed

It is generally advisable that the grinding wheel be run at a high speed. Just what is meant here should be carefully considered. It is generally desirable that the hard particles of abrasive material be carried past the work at some speed around 5000 or 6000 feet per minute. As a mile contains 5280 feet, this means that the pieces of abrasive material should be carried past the work at the rate of about 1 mile per minute. The number of rotations per minute is something different. A wheel may be turning very fast, if one thinks only of the rotations per minute. Thus, the spindle may be rotated at 7000 turns per minute. If the circumference of the grinding wheel on this spindle be 6 inches, then the rate of speed of a point on the rim or edge will be only 3500 feet per minute. But if the wheel have a circumference of 6/7 of a foot, then 7000 turns per minute will suffice to give a rim rate of 6000 feet per minute.

There are small speed indicators, costing perhaps $2.50, which, with a watch, will enable the observer to test a spindle for its number of rotations per minute. All one has to do then is to multiply this number by the number of feet round the rim. This will give the *peripheral speed* in feet per minute, and it should be round 5000 or 6000 feet per minute. When the wheel wears away and the

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circumference becomes smaller, the rotations per minute have to be suitably increased in order to get the speed back. If the grinding wheel is very small, it is sometimes rather troublesome to provide for a rapid enough rotation of the spindle. But it should be done, if the best results are desired.

Wet Grinding

Naturally, the work tends to heat up from the friction between the metal and the wheel. If the job is one where hard white iron is simply to be cut off of a repaired cast iron pipe in order to smooth off the surface and make the whole presentable, then the heating up may have no bad effects. But if the work consists of a cold chisel which has already been carefully hardened and tempered, this heating up will probably destroy all the tempering and hardening.

This introduces the idea of the desirability of *wet grinding*. The operation of grinding is carried out while a stream of water flows onto the metal at the place where it is held against the grinding wheel. Such a jet of water is not a bad thing in general, even where there is no tempering nor hardening to protect, if there is no especial inconvenience, as the water naturally quenches all sparks and hinders flying particles that are cold. There are simple grinding machines for ordinary shop use that are designed to furnish a water jet or stream.

Safety in Grinding

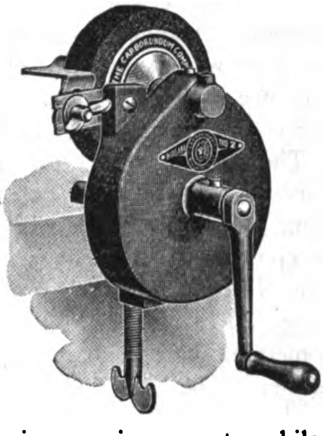
Grinding wheels are sometimes dangerous affairs, especially the bigger ones. Centrifugal force is the dangerous thing. When a bucket of water is held by the bail and swung round in a vertical plane, even a very moderate speed is sufficient to keep the water from spilling when the bucket is upside down. Centrifugal force—operating *away from* the center—has overcome the gravitation of the water. In order to protect the workman, grinding wheels are often inclosed in a hood, so that if the wheel breaks up from centrifugal force, the pieces will not fly off.

Another safety arrangement consists in the mode of applying and the extent of the clamping discs which hold the wheel between them. I have not space here to go into these matters in detail. Suffice it to say that wheels can now be made very safe, provided the right kind of devices are used.

Polishing

A very similar device to the ordinary grinding wheels mounted at the ends of a spindle operated by a pulley at the center is the usual *polishing lathe*. The spindle projects further perhaps, and instead of the grinding wheel, one mounts upon one or both of the spindles a *polishing* or *buffing* wheel. These are made of various materials, such as leather, cotton, etc.; they are used with powdered abrasives. The abrasives cut just as the hard grains in a grinding wheel do, only the particles used in polishing and buffing are quite small, and they may be held to the work less severely. All the same, the action is eventually the same. By grading the abrasives down to quite fine ones, the articles may be thoroughly and splendidly polished.

This matter may have only a moderate interest in a repair shop. At the same time, there will, now and again, be times when polishing will be desirable. The suggestion is made that where a little, but only a little of polishing work will ever be done, the grinding head be arranged so that a grinding wheel may be carried on one end of the long spindle and a polishing wheel on the other end. Then the shop is ready for both grinding and polishing.



Where Power is Not Available the Hand Grinder Shown at the Right is a Very Practical Machine

Thus, the shop may have various engine or automobile parts to repair and put in condition. The possibility of polishing at the end of other operations has accordingly some appeal. However, one caution is to be set down here. The fine material flying off from the polishing wheel is injurious to human beings. So an *exhaust hood* or equivalent device is to be provided. Something similar should, in fact, be provided for dry grinding.

The Cementing Material

The abrasive particles are held together by a kind of cementing material—clay, glue, rubber—and are carried off, after performing their duty, along with this material. Most grinding wheels are, to-day, made with a clay cementing material, the wheel being put through the vitrifying treatment. For a wheel to cut freely, it is necessary that the cementing material should wear away rapidly in order that fresh, and therefore sharp, abrasive particles may come promply into action. It is not to be considered good economy to use wheels that resist wear as they are used. Unless the wheel wears away promptly, dull abrasive particles are being made to do the work. Of course, one can go to the other extreme and use a wheel that wears away with needless rapidity.

Grinding wheels are given numbers. These indicate degrees of fineness of abrasive particles. Grinding wheels are also given letters—from A to Z. These indicate degrees of hardness. The larger the number on a wheel, the finer is the grain size of the abrasive; the further along in the alphabet the letter on a wheel, the harder is the cementing material. But not all manufacturers follow the letter system as indicated above. The Norton Company uses the letters A to Z, A being the softest. The Carborundum Company reverses this.

The rest is to be kept close up to the grinding wheel. As the wheel wears, it is to be readjusted and set close up, always so that it just clears the wheel. If this caution

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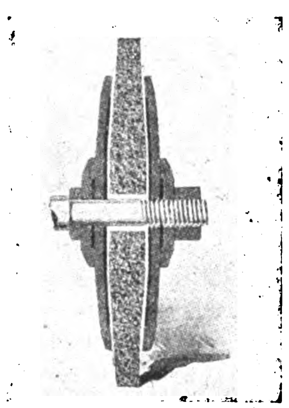
is neglected, the work may become caught between the rest and the wheel.

Emery, corundum, and carborundum wheels—all—are suitable for grinding rough castings and rough-forged articles.

A wheel not provided with a flow of water may be used for grinding hardened and tempered chisels and the like, provided the workman uses good judgment and that he runs and then dips the part of the tool being ground into a bucket of cold water. This is to be done every few seconds. Another make-shift consists in having some one pour water on the wheel and work, at the place where they are in contact. Or, one may arrange a flow by the use of a little ingenuity and a flexible tube.

The selection of the number and letter of a wheel will vary with different persons. However, I will try to give some guidance. If the work to be ground is what would be compared with what is usual around a machine shop, the Norton Company's grain size may be selected in the range 20 to 36. The grade of the wheel itself may be something harder than medium hard, but not much harder. These data are for alundum wheels. With the Carborundum Company's wheels, the same kind of work may probably be done with grit numbers in the range 20 to 30. The wheels themselves may have a hardness corresponding to H and to I.

But a very good plan consists in telling the manufacturers just about what kind of work there will be to do and in asking him to select two, three, half a dozen or a dozen wheels best suited to the jobs likely to come into the shop. It is his business to help the customer to the right thing.



Cross Section of Grinding Wheel Mounted on Arbor. This Cut Illustrates the Application of Safety Clamping Discs

Because of the high speed at which emery wheels run, it is desirable that they shall be symmetrical in form. The mode of manufacture of most wheels is understood to be such that a certain amount of shrinkage occurs when the cementing material hardens. Here is one reason for warping out of shape. Whatever the causes, even new wheels may be out of shape, and thy get so by use. It is desired to get a truly round surface on the periphery in order that the wheel may cut continuously and not merely when high spots come along. It is also desirable that any side warpage be eliminated.

The Truing

There are two tools for this purpose. One way is to use a diamond tipped tool and cut away the high places with it, as the wheel is rapidly operated. Instead of this tool, one may, however, use a dressing tool whose business end is fitted with a rotary wheel made of steel or chilled iron. This wheel when held against the rapidly rotating emery wheel is made to rotate. Its surface is roughened by flutes or teeth and these as they turn, dig out the bits of emery from the cementing material. No grinding wheel should be installed, unless a truing wheel or an equivalent is provided.

New wheels should be run carefully, to see whether they are exactly true, both on the faces and the periphery. After a wheel has gone into service, it should be tested for trueness to shape every now and then. The wheel cuts down the periphery but does not operate evenly. If the peripheral surface is not perfectly round, then there is more or less waste of labor and power when the wheel is in actual use, since it cuts only part of the time. So, time is not lost that is spent on getting the wheel edge perfectly round and true.

(Editor's Note. The cuts illustrating this article are used through the courtesy of the Carborundum Company of Niagara Falls, N. Y.)

WHEN TO GRIND MOTOR VALVES

By George G. McVicker

The time to grind the valves of the automobile engine is best determined by turning the motor over with the hand crank, pulling it over but one compression at a time and noting if the same pull is required for each. If one appears weaker than the others, it is probably due to an excess of carbon on the exhaust valve seat and can sometimes be removed by flushing out the cylinder with kerosene.

The engine should be run for a while before doing this, or even before testing for leaky valves, since the compression is not normal until the oil has formed a film about the ring and piston joints, and the expansion of valves and parts may be such as to affect the compression differently when hot from when cold.

When a cylinder seems to hold the compression better, the harder you pull on the crank, the valves probably do not require grinding, but when you can feel a slow steady leak as the crank is pulled up, the pressure is probably creeping out under one of the exhaust valves and the only way to stop it is to grind it to its seat.

The greatest enemies to the success of most men are laziness, ignorance and fear.

When you can meet a man at the door and shake hands with him and make him feel you are glad he came, you have made it fifty per cent. easier to sell to him.

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Spring Cleaning

This Installment on Valve Timing Fourth of the Series

By FRANK L. ALMY

IN THE previous articles of this series we have taken up, in detail various repair subjects. In this and the next article we will consider the engine as a complete unit and confine ourselves to more general adjustments and repairs. Perhaps there is no better subject to take up at present than that of timing as applied to both ignition and valve action and so we will consider this subject in this article.

In the earlier engines the matter of timing, and we include both ignition and valve timing, was not so important because the earlier engines were comparatively slow speed machines. But with engines operating at from 1500 to 2500 revolutions per minute, the timing, at present, is vital.

After the gas is compressed in the cylinder and ignited by a spark an appreciable interval elapses before the fire has traveled throughout the mixture and the explosion has reached its maximum. Were we to test the pressure strength we would find that the pressure would increase gradually after the spark ignited the mixture and only reached its maximum after an appreciable interval. The effect of a compressed gas vapor explosion in an engine is entirely different from that of powder in a cannon.

Most of us who have handled guns are familiar with the effect of a cartridge which "hangs fire." In such a case the shot or bullet is not ejected from the gun coincident with the descent of the trigger but is greatly delayed. The explosion of a gas mixture in an engine after the application of the spark is similar to the "hang fire" of a gun.

During the time that the engine is hanging fire, if we may use this expression, the piston has time to descend upon its working stroke. If the spark is timed late, then the piston descends far on its working stroke before the mixture expands and gives power.

Maximum Expansion

It is obvious that the maximum expansion should take place shortly after top center of the piston stroke and not before. If the maximum expansion or "push" occurs half way down on the power stroke, then much of the power is lost, the expansion escaping through the exhaust.

If the expansion occurs before top center, then the engine will tend to run backwards. If the maximum expansion occurs at dead, top center it tends to drive the piston directly downward and therefore pounds against the crank-pin, thus causing a knock. The maximum expansion or explosion of the mixture, then should occur just as soon after top center as possible and the sooner it occurs, the more powerful the action.

If the maximum expansion should occur shortly after top center it is plain to be seen that the spark must occur before top center and this amount of time depends upon the speed of the engine and the speed of burning. It is a point which can only be determined by experiment, as shown later. The faster the engine runs, the further must the spark be advanced.

If we were to set the spark to occur before top center and then were to crank the engine by hand the machine would "kick," or tend to run backward. For this reason the spark must be set at top center or shortly after. In practice for light engines the spark should be set at top dead center. For sixes, eights and twelves, however, the spark should be set to occur slightly after top center. This gives us all the data necessary for setting the spark.

Setting the Spark

First crank the engine until the piston in number one cylinder is at the top of its stroke. This point may be determined by inserting a stick or wire in the spark plug hole and resting it upon the piston head. Make a mark upon this stick or wire and watch the mark. When it ceases to rise and just barely starts to fall, stop cranking the engine and you have the point at which the explosion should occur.

Retard the spark lever on the steering column and set the magneto or timer, or ignition unit so that the spark will occur in number one cylinder. Connect the secondary wires to the spark plugs in the proper firing order and the ignition is properly timed.

As a general rule the manual control enables the operator to advance the spark while the engine is running, far enough to cause the maximum explosion expansion to occur slightly after top center. The spark lever should be advanced as far as practical at all times. If the spark is advanced beyond this practical point the engine will pound. Then it is only necessary for you to experiment a little, find that position of the spark lever causes a pound, drop the lever back enough to stop the pound and you can be fairly sure that you are obtaining the maximum from the explosion.

It might be well at this point to tell how to find the firing order of an engine. Turn the engine over and at the same time watch the action of the valves. Choose one set, the intake, for instance and mark this set with white chalk so that you can watch them more easily. The firing order is the order in which the valves open or close. The same is true regarding the exhaust valves. If the timing gears

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have been removed you can accomplish the same thing by turning the cam shaft in its normal direction of rotation and watching the valves in the same way.

While the timing of the spark is an easy matter on all engines due to the fact that it should occur at dead top center with the spark lever fully retarded, the timing of valves is not so easy. Not all engines are timed the same and through we may be able to strike a fair average we cannot be absolutely certain of the exact timing of a particular engine unless we have the directions from the manufacturer. Since such directions are not always to be obtained we are often forced to depend upon theory as applied to average engines.

The idea in timing valves is to set them in such a way that nearly all of the burned gas will have time to pass from the engine and a complete new charge can be drawn in. Naturally it is not possible to move all of the old gas because the piston does not traverse all of the cylinder.

It has been found by experiment that exhaust gas continues to expand somewhat even after the piston has reached the top of its stroke and for this reason if the exhaust valve is left open after the piston has passed top center, more burned gas if forced out than if it were closed at top center.

In the same way it has been found that fresh gas is drawn into the cylinders even after the piston has passed bottom center. These two facts have resulted in the practice of opening and leaving open the valves much differently from what theory dictates. In the average four cylinder engine the exhaust valve closes from five to eight degrees after top center and the intake opens from three to four degrees farther along, or from 8 to 11.5 degrees after top center.

If this rule, in setting the closing of the exhaust valve and the opening of the intake valve, is followed, then the opening of the exhaust and the closing of the intake will take care of itself.

In the average six cylinder engine the exhaust closes, usually, earlier than on the average four and the intake opens, usually, much nearer to the closing of the exhaust. Stated in actual, average figures or degrees, the fact would be approximately as stated for four cylinder engines.

A Simpler Explanation

For the layman, who may not understand exactly the meaning of degrees as applied to valve setting we might mention that an ordinary clock face, marked with 60 minute marks may be used as an illustration. Each of the minute marks represents six degrees. From this it can be seen that the minute hand, at five minutes after the hour is advanced 30 degrees. At quarter past the hour it has advanced 90 degrees and so on; the circle comprising of 360 degrees.

From this it is easy to set the valves fairly closely by means of a dial or clock face attached to the crank shaft. First remove one of the timing gears. Usually it is an easy matter to take off the gear on the cam shaft. Over the end of the crank shaft slip a pasteboard clock face or dial which has been carefully divided into 60 sections. This is an easy matter if you have a pair of compasses at hand. Strike off a circle and use the same setting to measure off one set of divisions on the circle thus struck off. This setting will divide the circle into six equal parts. A few trials will enable one to divide each of these parts into five equal parts and then by dividing each of these five parts equally the result will give the 60 parts required.

Bearing in mind that each of these small parts represents 6 degrees turn the crankshaft until the piston in number one cylinder comes to its dead top center. Then fix a pointer or make a mark on the block directly under one of the small divisions on the dial. Turn the crankshaft forward one division and it is 6 degrees past top center and at the point where the exhaust valve ordinarily should close.

Adjusting the Valve Clearance

Adjust the valve clearance for the exhaust valve in number one cylinder so that you can just slip a thin piece of paper between the tappet and the valve stem, when the tappet is at its lowest point. Leave the paper in place and slowly turn the cam-shaft in its normal direction of rotation, (opposite to that of the crank shaft) until you see that the tappet is rising. As you turn the cam shaft still further, keep the paper between your fingers, move it backward and forward until it is gripped by the tappet and valve. As soon as the paper is gripped it indicates that the valve is about to open, turn the cam shaft still further until the exhaust valve has opened and almost closed. As soon as the paper is released, indicating that the valve has fully closed, mesh the timing gears and the engine is correctly timed.

Turn the engine over two or three times and put the paper between the tappet and intake valve. Turn the engine slowly until the valve grips the paper, indicating that the intake valve is opening and then look on the dial to see if the intake valve is opening at the proper time. You will remember that the intake should open at a point, in degrees, corresponding with about 1½ minutes past the hour. The hour mark being dead top center.

The action of the engine under these conditions should indicate whether or not the valves are correctly set for this particular design of machine. If the engine tends to overheat, and the operator by a process of elimination is sure that the trouble is due to the valve timing, then it is probable that the exhaust valve closes too soon. By advancing the crank-shaft timing gear one tooth this trouble should be overcome.

If, on the other hand, the engine is sluggish and seems to lack power, then indications are that the exhaust valve closes too late and that the discharged gases are drawn back into the cylinders at each intake stroke. In such a case the cam shaft gear should be advanced one tooth.

The size of the cylinders as compared with the valve openings, the speed of the engine and the lift of the cams all are items which have an effect upon the actual timing of the valves.

Before we close this article we might mention one fact

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which might result in considerable confusion. We have said that the exhaust valve averages to close after top center and that the intake opens slightly after the exhaust closes. Although the first statement may be relied upon in 999 cases out of 1000; the second is liable to modification. In some engines there is an overlapping of the valve action. That is to say, the intake valve may start to open *before* the exhaust has closed.

This overlapping effect need not worry the operator, however, if he will be guided by the exhaust valve setting in making all adjustments, and use the intake setting to check up the work only.

L. G. SUSCIPJ DEAD

Lorenzo G. Suscipj, whose good fellowship and kindly cheer distinguished him among advertising men whose good fortune it was to know him, succumbed to a short and unexpected attack of pneumonia on April 23rd at his home in Mt. Vernon, N. Y.

Mr. Suscipj was born in Rome, Italy, 45 years ago, of an old and prominent Italian family. Here he received his early education, afterward joining the army where he became lieutenant of artillery. In 1902 he came to the United States and began forthwith his advertising career. His training was received in newspaper work in Syracuse.

After five years, he went to Chicago to enter the employ of the Union Carbide Company and later became Assistant Advertising Manager. Here he was active in advertising and organization work and when he left Chicago to become manager of the advertising department of the eastern office of New York City, he was tendered an unusual token of appreciation and affection by his associates.

In 1917 when Murray, Howe & Company, New York advertising agency, secured the account of the interests with which Mr. Suscipj was affiliated, he saw the opportunity to enter an organization where he could give the benefit of his experience and reap the benefit of cooperation. He was appointed Secretary and Contract Manager of the company, which post be occupied until his death.

He made many friends and valued them and he in turn was ever the recipient of the good will and friendship of all his colleagues. A man of sterling character his passing will be regretted by all those who knew him.

Services were held at his home in Mt. Vernon on Sunday, April 24th, his body being removed for interment to Cincinnati, the home of Mrs. Suscipj—his only surviving kin in America.

ANOTHER USE FOR THE ACETYLENE TORCH

By JOE BELL

UP NEAR Otisville is located the stone crusher used by the contractors who are building the new State road over the Shawangunk mountains. The rock is the hardest kind of trap and has been quarried and crushed for ballast and roads for many years but when a fellow accidentally dropped a twenty pound sledge in the crunching jaws of the crusher, the machine stopped dead as the belts came off. They thought they could pull the hammer out and start up again, but no—that hammer was as tightly held as the 150 H. P. engine could force the jaws together and no amount of driving would loosen it. It looked like a case of move the platform so they could get at the machine and take it apart.

That required outside help and the boss was just dismissing the gang when along came Horace Patterson in his trusty kerosene burner (Ford, of course). Horace was naturally curious, as well as mechanically inclined. "How much will you give me if I get that out for you in an hour without moving anything else?" "Twenty-five dollars," said the boss. Well, Horace was back in half an hour with his small acetylene outfit in the car. This he transferred to the deck of the stone crusher, lighted the cutting torch, and proceeded to melt away enough of the sledge hammer to allow it to be picked out. Then Horace pocketed his twenty-five and rattled away in his Ford.

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Automobile Dealer and Repairer

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

An Indispensable Machine

FROM the highest authority in the land comes a statement which deserves the consideration of every thinking man. President Harding in his first message to the Special Session of Congress, calls for amendments to the Federal aid road act which will strengthen it and says that the "motor car has become an indispensable instrument in our political, social and industrial life." Mr. Harding continues—"The Federal agency of administration," (he is speaking of the road act), "should be elevated to the importance and vested with authority comparable to the work before it. And Congress ought to prescribe conditions to Federal appropriations which will necessitate a consistent program of uniformity which will justify the Federal outlay."

In our April issue we mentioned, in an Editorial, the popular feeling toward automotive vehicles and their relation to the tax burden. Mr. Harding has shown that his ideas coincide with ours and that he thinks the Federal Government should carry its share of the responsibility of maintaining our roads.

If Mr. Harding feels, and admits, that motor traffic is desirable and that commerce is helped, that communities are bettered and social intercourse, which makes for better industrial relations, improved, then should not Mr. Harding go into this matter even more deeply than he has? Should he not see that inter-state communication be made easier?

Take the instance of New York and New Jersey, two states which are almost one insofar as automobile traffic is concerned. And yet an automobile or truck owner in New Jersey is practically forced to break the laws of the State of New York if he wishes to use his machine or machines extensively. New York state automobile laws are reciprocal and are as broad as possible, they show that New York legislators are broad minded and are looking for the common welfare. New Jersey places a limit upon the time allowed a visiting automobile on her roads. A narrow minded policy.

An automobile registered in New Jersey cannot be operated on the roads of any other state over 15 days without breaking the law. Such a narrow policy works against a New Jersey car owner. If our President wishes to promote his ideals regarding motor traffic he will see that a Federal law is enacted to allow the car owners of every state equal rights in every other state.

We pride ourselves on being Americans. We pride ourselves on being citizens of "the land of the free" and yet under such laws as the one mentioned, the country is broken up into states. Will Mr. Harding see that this condition is rectified and that our various states conform to the Constitution? Will Mr. Harding make this nation really a "land of the free"?

A "Let Me Show You" Letter

FROM one of our subscribers, Mr. Vinicombe of Brooklyn comes a letter together with an enclosure which we feel sure will interest all of our readers. This letter is an example of the kind which Mr. Vinicombe uses for obtaining new business and contains a number of points which are valuable. We quote the letter:

"I can prove to you that you can keep your automobile in good condition without paying for repairs that you do not need. You may stand by and see all of the work done on your car. I do not 'make a job' where none exists.

"I personally do all the work and do not leave it to helpers or assistants. I am thoroughly experienced in repairing the electrical systems of automobiles and have specialized on Delco, Remy, Westinghouse, Entz and Auto-lite.

"If you have a 'stubborn case,' electrically or mechanically, let me see it. It will cost you nothing to come to my service station at any time and ask questions. I am willing to show you that I can save you money and keep your car in the best possible condition."

A letter such as this is bound to get the business because it indicates confidence in the work. If your customer is allowed to watch the work as it is being done he can be sure that the work is done right and that he is not being overcharged.

Every repair man is familiar with the cry of the customer who thinks he is being over charged for work. Our subscriber tells how to avoid such criticism.

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Re-Babbitting Main Bearings

How to Equip One's Shop for This Class of Remunerative Work

BY DAVID BAXTER

THE casting of babbitt in automobile crank case and cylinder block bearings is not a complicated process but it is not so simple as it looks if the mechanic is not especially equipped for this class of work. Particularly if he wants to cast a set of bearings that need a little scraping or other machining after they are poured, he will find it rather difficult.

In spite of the seeming simplicity of the babbitting process, the novice will find there are several tricks he would do well to learn before attempting the job. There are several details that must be attended to carefully to insure the best results. A little neglect in any of these factors may force the mechanic to do the whole thing over again, after the work is practically finished.

The method of pouring, or casting, babbitt bearings is practically the same for all makes of cars if the crank shaft is used for shaping the metal. But if the shaft is not used a special jig must be made for each different car. This is probably the best system, although a trifle more expensive, unless a considerable number of each type of car is served. This is usually the case as many garages specialize on one make of car.

Let us take for example the Ford car, as it is more or less familiar to every garage mechanic. In fact if it were not for the modest Ford, lots of garages would have considerable idle time. A special babbitting jig ought not to be a bad investment for any garage. Such a device is easily made out of a true bar of shafting if the mechanic doesn't want to purchase one ready made. The design of this is clearly shown in Fig. 2 of the accompanying illustrations.

Making a Babbitting Jig

First a short piece of shafting is secured that is perfectly true and straight. Turn down on a lathe six shoulders to correspond to the ends of the three bearings as indicated in the pictures. These shoulders or flange collars should fit the ends of the bearings exactly. In other words, make their babbitt tight; sufficiently snug so that melted babbitt can not seep through. The part that fits the bearing should be machined and polished smooth but the balance of the jig may be rough cut. Considerable metal should be removed by the rough cutting but not so much as to render the jig easily bent; just enough to lighten it. The polished sections should be the exact size of the original crank if it is to be used again.

After the lathe work is finished a small hole is drilled through each bearing section of the jig. This must be exactly through the center from side to side of the shaft. These holes should be not over three-sixteenths of an inch in diameter. Then each bearing section should have another hole the same size drilled in, approximately a half inch. These holes should be nearly exactly between the ends of the first holes. That is, from the end of one

Figure 1. First cut the old babbitt out of the bearings with a chisel.

hole half way around the shaft. A piece of snug-fitting steel is then driven through each long hole, and a shorter piece is fitted into the middle holes.

These metal plugs should protrude beyond the sides of the shafting the exact thickness of the babbitt bearing; they are to serve as guides or thickness gauges to enable the mechanic to get the bearings always the same thickness. One of the little steel plugs rests on the bottom of the bearing and the other two against the sides. By this arrangement the babbitt space is equally divided around the shaft. The spacing is automatic and mistakes cannot occur.

Each bearing section has its own set of guides so that all that is necessary is to drop the jig in the bearings and turn it so that one set of gauges rests upon the bottom and the others touch the sides. These guides should be off center endwise to provide for the oil holes in the casting.

The rest of the babbitting outfit consists of a common babbitt-ladle and a furnace to heat it, together with a small quantity of babbitting putty or fire clay. A handy putty is made of cement mixed with heavy cylinder oil to

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the proper consistency. Other hand tools needed are usually found in any garage.

Now, let us see how the details are worked out. Suppose a Ford block comes in needing a new set of babbitt bearings, or to be rebabbitted. The first thing to do is to put the babbitt-ladle on the fire so the metal can be melting while the block bearings are being arranged. The babbitt metal should not be heated too hot, however, and the mechanic should examine it from time to time. Nor should it be poured too cold as it will not run the bearings well. This is one of the important details the novice should be careful about; the matter of melting the metal to the proper fluidity.

There are several simple tests which the novice may apply to ascertain a close approximate of the right temperature for pouring. One of these is to dip a soft pine stick into the molten babbitt; if the pine is charred the babbitt is ready to pour. Another test is to apply a strip of newspaper to the surface of the molten babbitt; if it ignites the babbitt is ready to pour.

Removing Old Bearing Metal

While the babbitt is melting the next thing to do is to remove the old bearing metal from the block. This is usually done with a hammer and chisel. Fig. 1 shows the manner in which this is accomplished. The blade of the thin chisel is inserted beneath the end of the worn babbitt by tapping it lightly with the hammer. As the metal peels off the chisel follows it down. It is of little avail to try to take the bearings out whole but some arrangements

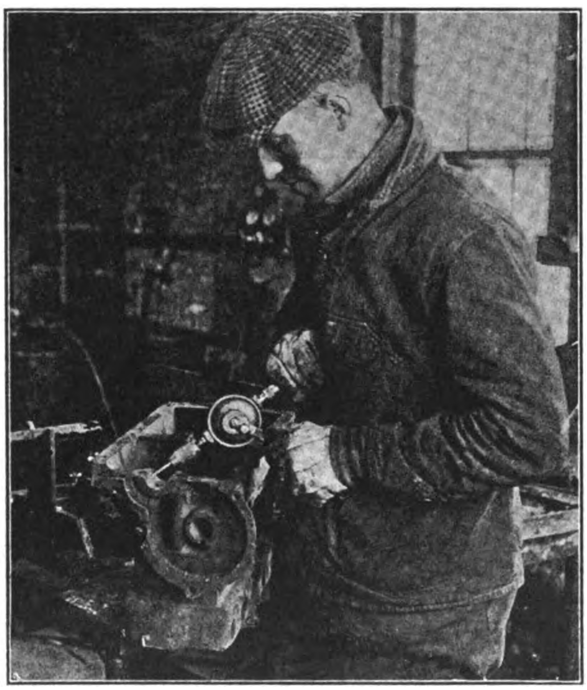

Figure 2. Bore the old babbitt out of the anchor holes.

should be made for saving the metal as it can be used again.

Fig. 2 indicates the next step in the process. This is the removal of the old babbitt from the anchor holes. Each anchor hole is cleaned out with a drill. A small breast drill is very convenient for this. None of the holes should be overlooked as they are the only way by which the new bearing is to be held in place. All of the drill chips should be blown or shaken out of the casting. After drilling the anchor holes the next important detail is to see that the bearings are all clean and dry. A good way to make sure of this is to heat each bearing with a blow torch or with a

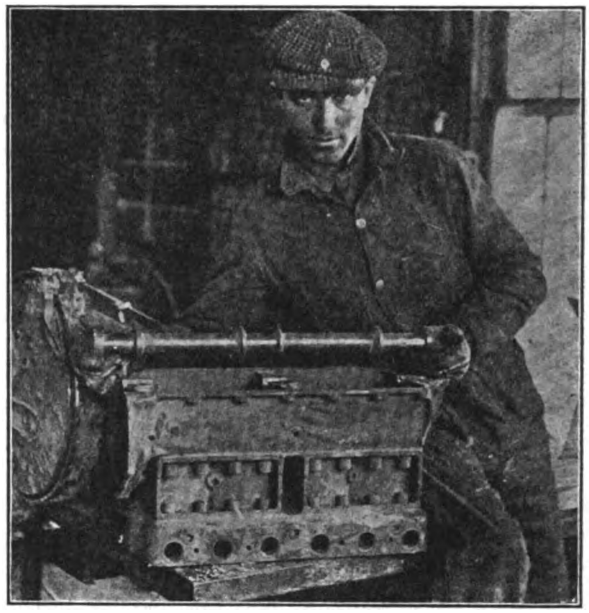

Figure 3. Babbitting jig made especially for Ford bearings.

welding torch if one is at hand. In this way the moisture is certain to be driven out of the casting. In cold weather the chill is also removed by heating. Both of these are important since cold metal or moisture and molten babbitt do not agree very well. Hot babbitt is inclined to beat a quick retreat when coming in contact with moist metal. For this reason the mechanic will do well to guard his eyes and hands when casting babbitt bearings; even though he thinks he knows the bearings are perfectly dry and warm.

Sometimes a very slight amount of moisture is present; this tends to cause seams or unconnected streaks in the new bearing. Sometimes the cold iron chills the molten babbitt to such an extent that it does not run as it should but leaves holes in the bearing. Therefore the heating and cleaning eliminates most of this trouble.

When certain that the bearings are clean and dry the jig is inserted as shown in Figure 3. It cannot go wrong as it will only fit one way. But the metal thickness gauges can be placed wrong if the mechanic is careless.

After placing the jig in the block a small quantity of the clay or babbitting putty is banked up around each bearing. This forms a small pocket through which the bearing is poured. It also prevents the babbitt from overflowing and getting wasted. With the clay pockets in place the metal may be poured faster and therefore be more certain to run properly. A bank of clay on the side of the jig opposite the pouring will permit the metal to fill the bearing entirely full, and square across the top edge.

Any surplus babbitt may be cut off level with the casting quite easily, since it is thin in this section. Therefore the mechanic need not worry about filling the bearing over-

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full. In fact it makes a more solid bearing to do this if the clay is well arranged.

Next the oil holes are stuffed full of paper or asbestos-and-oil putty. Or better still this can be done before arranging the jig as this permits the mechanic to level the packing next to the bearing. This packing is principally to prevent the melted babbitt from leaking. But it is just as well to have the bearing smooth. A small quantity of babbitt may be cleaned out when boring the new oil hole, but it is just as convenient to fill the oil hole level full of packing before pouring the metal.

When the casting arrangement is complete the metal is tested to see if the temperature is right before pouring. Then the bearings are poured one at a time in rapid succession. Figure 4 indicates the pouring of the babbitt as well as the clay pouring-pockets.

Skimming the Dross

The mechanic should be careful that the dross on the molten babbitt does not slide into the bearing. It is better to skim this stuff before starting to pour because then he is not bothered with it. A steady hand and deft movement will then insure a better job. The pouring is commenced at the end of the bearing and the ladle is deftly moved along the opening as the metal runs into it.

The tipping and sidewise movement are executed at one and the same time; after the mechanic becomes proficient in the knack of pouring. It requires but one splash of the babbitt to fill the entire bearing—so to speak. If this work is handled rapidly the metal has no chance to cool, or have its pouring temperature lowered. The bearings are all poured at practically the same temperature.

After pouring all of the bearings the jig arrangement is allowed to remain intact for several minutes to permit

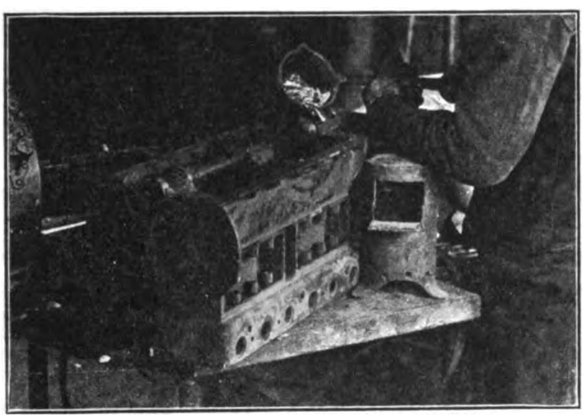


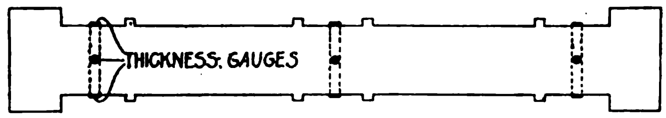
Figure 4. Bank up around the jig to prevent spilling the molten babbitt.

the metal to become thoroughly set. Then the clay or babbitt putty is carefully removed with a sharp pointed tool. After this the surplus babbitt is cut level with the flat part of the casting. This is readily done with a knife or a sharp tool made out of a hack saw blade.

The surplus metal is cut loose on both sides of all bearings before attempting to remove the jig. Then the jig is carefully pried out. If the bearings are all good the oil holes are located and cut in the new bearings. The packing is removed from the oil holes in the casting. The fins of metal are trimmed off if there are any. Then the oil grooves are cut if such are necessary. If the jig has fit accurately very little dressing is needed, however.

If the mechanic desires to use the crankshaft instead of the jig it will be necessary for him to devise some arrangement for him to gauge the metal thickness. It may be necessary to press some putty around the ends of each bearing to prevent the babbitt from leaking. Otherwise the pouring procedure is practically the same.

The metal thickness is gauged by cutting two strips of cardboard which should be the exact thickness of the new bearings. One of these is placed beneath each of the two ends crank pins; the side thickness being measured for accuracy. The center bearing is poured. Then the crank shaft is removed and one of the strips of cardboard taken



Bottom View of the Jig Showing Thickness Gauges or Guides.

out of an end bearing. The shaft is replaced in exactly the same position. This end bearing is puttied and poured. Then the crankshaft is removed again to take out the last

When the shaft is once more replaced the two end bearings will hold it so that the last bearing is accurately spaced. This bearing is puttied and poured like the first two; after this all three are ready to be trimmed and put back in service. This part of the work is practically the same as described for use in connection with the jig.

Now, it is scarcely necessary to caution the mechanic about filling the oil holes before starting on any of the bearings. To repeat—the metal should be clean and warm before introducing the molten babbitt lest some one gets burned.

With the theory in mind about as given above the novice should be able to babbitt other types of automobile engine cylinder blocks as well as that of the flivver.
strip of card.

AS HEARD AT THE SERVICE STATION

Chauffeur of Pierce-Arrow—How far is it to Kansas City?

Service Station Man—Forty miles.

Chauffeur of Pierce-Arrow—Give me an inner tube and 10 gallons of gasoline.

Owner of Cadillac—How far is it to Kansas City?

Service Station Man—About forty miles.

Owner of Cadillac—Give me one spark plug and five gallons of gasoline.

Ford Owner—How far is it to Kansas City?

Service Station Man—Forty Miles.

Ford Owner—Give me some water in the radiator and a package of Camel cigarettes.—The Peptomist.

Irregular and taper shaped pieces are difficult to hold in a vise but can be gripped safely and evenly by the use of "equalizing jaws," which often save their cost on one job.

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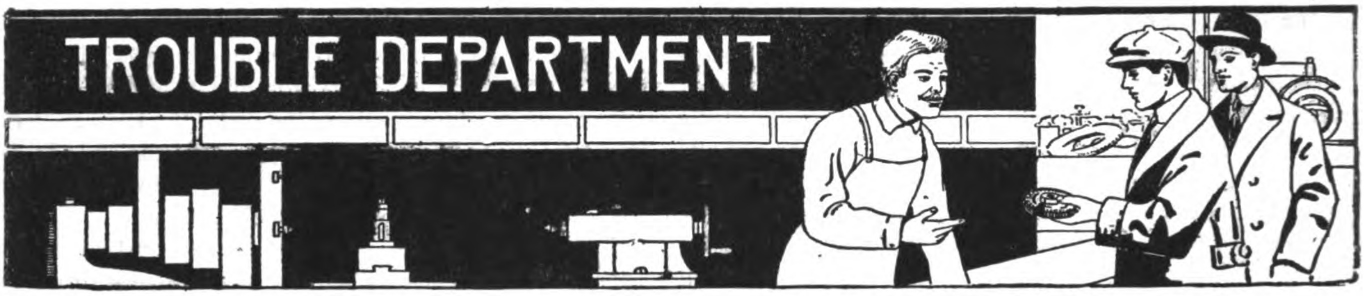

Does Not Run Smoothly

2982

From Paul Witteck, New Jersey: I have a Chevrolet 1917 Baby Grand. When running at low speed the car does not run smoothly although the engine works perfectly, hitting on all four. At a greater speed or on a pull this trouble is not noticed. I have tightened the keys in the rear wheels, have just overhauled the rear end. I noticed that the universal blocks have quite some wear. Do you think that this would cause the trouble?

Reply: Not only does the wear in the universals result in considerable lost motion between the engine and the wheels but such wear causes a great waste of power. A Universal joint is a necessary evil even when it is in excellent condition. Any flexible joint or machine element for the transmission of power other than in a straight line, absorbs power and vitally affects the action of the machine.

We would advise you to replace the worn out parts with new, or better still, to replace the entire joint.

Do not forget that the lost motion may occur at any point between the engine and the wheels. Be just as careful in your work on the clutch and the gear set as you have been on the rear axle.

Boring Holes in Pistons

2983

From W. B. Campbell, Tennessee. Can you tell me the advantage or disadvantage of boring holes in the pistons?

Reply: The speed of any machine is limited by nothing but safety factors, provided there is an unlimited source of power. That is to say, a rotating object, such as a flywheel or shaft, for instance, can be run at a constantly increasing speed which is limited only by the breaking point. This breaking point depends upon the weight and strength of the rotating object. Centrifugal force tends to burst the rotating object and it follows that if the object is light its centrifugal breaking point is high.

The speed of a gasoline engine of the reciprocating type, such as is now used, is limited by the weight of reciprocating parts. A certain amount of power is required to stop and start the pistons at each end of their stroke. The lighter the reciprocating parts, the faster can the machine be operated.

It is also true that the heavier the reciprocating parts, the more liable is the machine to vibrate.

Obviously, then, it is advisable to make the pistons and connecting rods as light as possible consistent with strength. For this reason designers often construct pistons which are only heavy enough to carry the necessary rings. Where it is advisable to cut down the weight of pistons in an engine the metal is removed from the skirt at some point between the wrist pin and the lower ring. This is usually done by boring holes through the skirt.

When doing this, it is essential that all pistons be balanced, each with the other.

Trouble with Buick 35

2984

From W. B. Lawrence, Vermont.—I have a Buick Model 35, which is equipped with the model L Schebler carburetor. I cannot seem to make it idle down the way it should. It will idle down for a second or two and then speed up, then idle and then speed up again. Sometimes when going back to idling, it will stop dead. It will misfire in one cylinder, but not often.

The valves have all been ground and there appears to be a good spark in all cylinders. The compression is also good. When pulling hard, the power is good, and the engine never misses fire. There is a heating pipe from the exhaust to the bottom of the carburetor.

What would you advise me to do?

Reply.—From your description, we believe that there is a tendency to "load up," that is for the gasoline to condense in the manifold or to be supplied at times in excess of the amount actually required. Except by careful examination of the engine, it is impossible for us to tell you how to locate the trouble and remedy it.

As a first suggestion, we would advise you to install some sort of a baffle plate at the front of the engine, so as to block the manifold and carburetor from breeze generated by the fan. If the engine still causes you trouble, we would advise you to enclose the intake manifold and the exhaust by a sheet iron stove arrangement. It is not necessary that this stove be perfectly tight, so long as it segregates the two manifolds in one compartment away from the outside air.

If you still have trouble we would advise you to obtain another make of carburetor on trial, or else have the model L Schedler carburetor examined by an expert on carburetion. In our opinion the Schebler carburetor is an excellent one.

If the new carburetor does not give any better satis-

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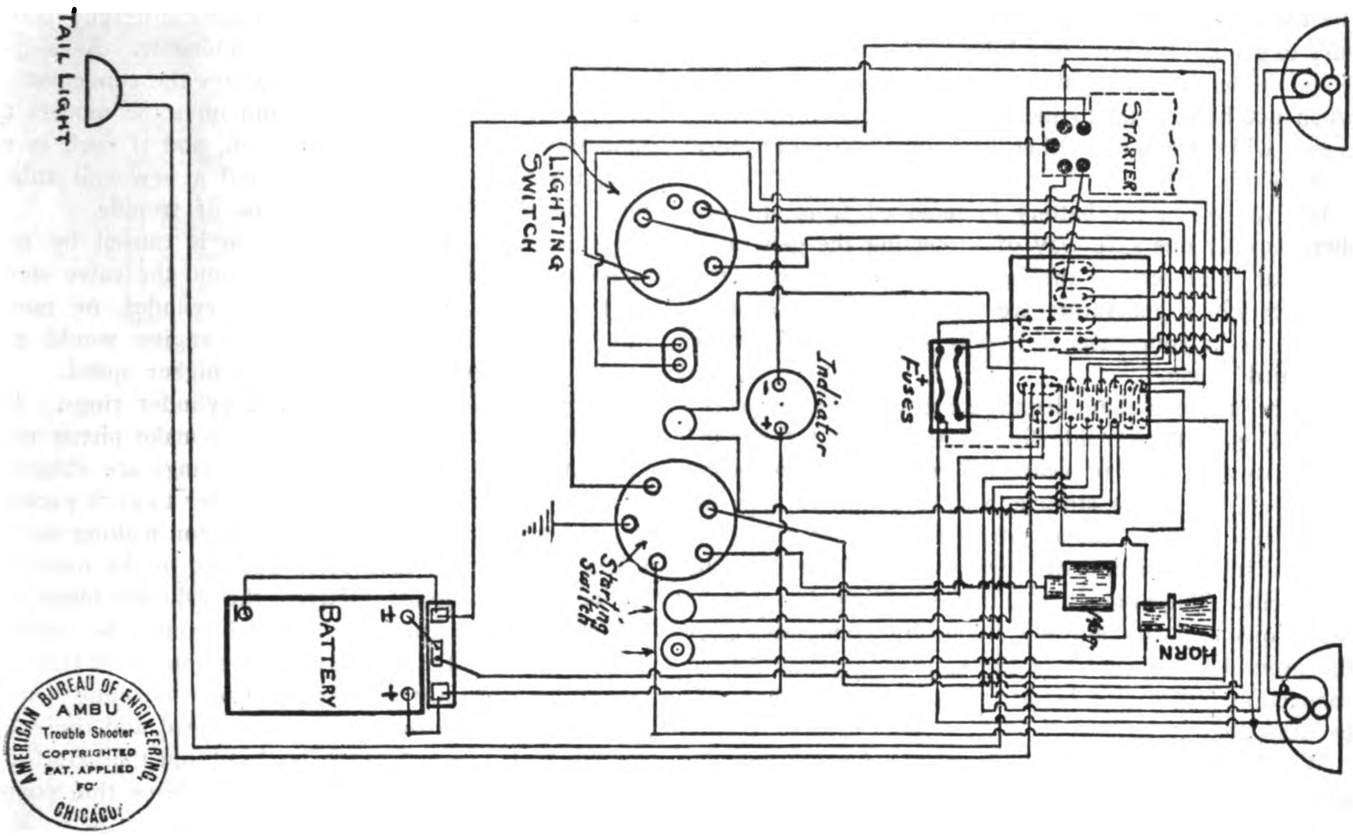
ENTZ White 1914 Steering Column Control



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faction we would advise you to remove the manifolds and examine the intake manifold passage for any projections or rough places inside. Do the same thing to the intake valve ports. Also see if the valve springs are strong enough to seat the valves properly. You can make a test of the spring strength while the engine is running by placing a screw-driver between two of the spring coils and giving it a hard twist. This will bring a greater tension on the spring.

Clutch Harsh In Operation

2985

From V. D. Rusling, New York.—The clutch on my Studebaker Sedan is rather harsh in operation. It chatters before and grabs when engaged. This clutch is the leather faced cone type. I have made several applications of Neats-foot oil which has improved its condition only temporarily.

I propose to insert under the leather facing either thin wooden wedges or pieces of discarded hack saw blades. Will you please advise how many of these I should use or whether or not their length should be equal to the full width of the leather facing?

Reply.—Only experiment will show how many wooden wedges or hack saw blades will be necessary between the clutch facing and the cone. We should advise you to install them about four inches apart around the circumference. If the clutch still grabs we should advise you to place them six inches apart. If the clutch does not hold properly, then place them nearer together.

The blade should not be as long as the full width of the leather facing, but should be about three-eighths of an inch shorter than the width. This will prevent their slipping out because the leather will then form around the wood or metal and hold the pieces in place.

Wiring of White Six

2986

From G. W. Simmons, Jr., Georgia: Will you kindly print the wiring diagram of the White Six-G. F. Sixty H. P.? built in 1912-13-14.—combination generator and started equipment.

Reply: While you do not state the electrical system with which this car is equipped and the other information is not very definite, yet we believe that you will be helped by the diagram which we are printing herewith of the White 1914 car equipped with the Entz system.

We are not absolutely certain that this is the diagram which you require, and if it is not, write us again giving us more detailed information, and we will endeavor to help you out.

Ground Off Wire When Recharging

2987

From Fred. B. Fischer, Maryland.—I have a 1920 Ford Sedan, and there has been some difficulty in keeping the battery charged fully, on account of the

fact that I use the machine mostly at nights, of necessity, I must use the lights a great deal. While getting the battery charged at the Service Station, is it necessary to ground the wire which leads from the generator? Some mechanics tell me that some wire must be grounded when not hooked up to the battery, otherwise the generator will burn out. Other mechanics say differently. Which is right?

Reply.—When the battery is removed from the car, there is only one safe way of protecting the generator, and that is to remove the brushes from the generator. In cases where generators are fitted with a three brush system as in your case, it is only necessary to remove the third brush.

There has been some dispute as to whether or not the grounding of the outside line in the case of the Ford F. A. system will prevent the generator from being destroyed, while the storage battery is not in the car. When this is done the armature is short circuited and only a small amount of current passes through the field coils. The amount of current passing through the field coils depends entirely upon the conductivity of the ground connection. If for any reason the ground connection happens to be poor, then the generator will be destroyed.

We do not recommend this method of protecting the generator, but would suggest that you always remove the third brush when the battery is removed from the car. If the machine is operated without grounding the outside terminal, or removing the third brush, then all of the current being generated is passed through the field coils. After a time, if the current is heavy enough the field coils will be burned out. This depends entirely upon the size of wires which happen to be used on the field coils. Possibly the Ford generator will stand a heavy over-load, but there is no reason to take such a chance.

Referring to your letter, we should judge that the charging rate of your generator is not high enough. We should advise you to increase the charging rate. In order to do this, it will be necessary for you to move the third brush further away from the grounded brush, or in the same direction that the armature rotates. We should advise you to have this done at a service station.

Cork Piston Rings

2988

From W. B. Lounsbury, Kanas.—I have a Buick heavy 4. When I crank it, it only runs on one and two cylinders, sometimes on three and four. Sometimes I have to take the contact points off and then when I put them back it will run for a short time. The faster it runs, the better it fires. The contact points are new. I have tried three different makes of carburetors.

I have heard that cork cylinder rings are sometimes used. Are they any good.

Can you tell me what the trouble is with my car?

Reply.—We are of the opinion that your trouble is caused by a broken condenser either in the coil or on the distributor head. We cannot say just at which point this condenser is located because different models have different locations for the condenser. As a general rule the Delco apparatus carries the condenser on the side of the ignition head, and on some models the condenser is located inside the coil, and if such is the case, the coil should be tested and a new coil substituted, if the old one shows signs of trouble.

It may also be that the trouble is caused by poor compression arising from leaks around the valve stems, or the intake line, scores in the cylinder, or poorly fitted rings. In such a case the engine would give better results when operating at a higher speed.

We have never heard of cork cylinder rings. Nor do we think it would be possible to make piston rings of anything but metal, because the rings are subjected to a high degree of heat. If you refer to cork packing it is possible to use sheats of cork for making up the joints between the carburetor and the intake manifold, as well as the joints between the cylinder block and the crank case, but cork packing cannot be used at any point where there is an excessive amount of heat and where the heat must be carried off by the coiling system, such points as between the ylinder head and the cylinder block; between the cylinder head and the manifolds. Gaskets at these points should be made of thin copper sheeting and asbestos.

Valve Clearance on a Case

2989

From Ben Scherbring, Iowa.—Can you answer a few questions in regard to my Case 1913 Model, 30 H. P.? I have trouble with cylinders No. 1 and No. 4. They misfire quite often. This car is equipped with a Remy low tension magneto, model R. C. with the L. E. switch and coil.

I have the magneto set so that it will fire where No. 1 cylinder is at its upper dead centre compression stroke, and I have the other connections made so that the engine fires one, three, four and two. The engine has fairly good compression. I have used various makes of spark plugs with very little help. What is the value clearance for this engine?

Reply.—We should advise you first to check over the valve clearances in the following manner: Operate the engine until it has warmed up thoroughly, having first removed the covers over the valve stems. Turn the engine over until the piston in No. 1 cylinder is at the top of its compression stroke and ready to fire, then adjust the valve clearance so that the distance between the tappet and the valve stem is .003 of an inch. After the valves in the first cylinder have been adjusted, turn the engine over until the piston in No. 2 cylinder is at the top of its compression stroke and adjust these two valves. Run the engine again until it has warmed and adjust the other four valves in the same way.

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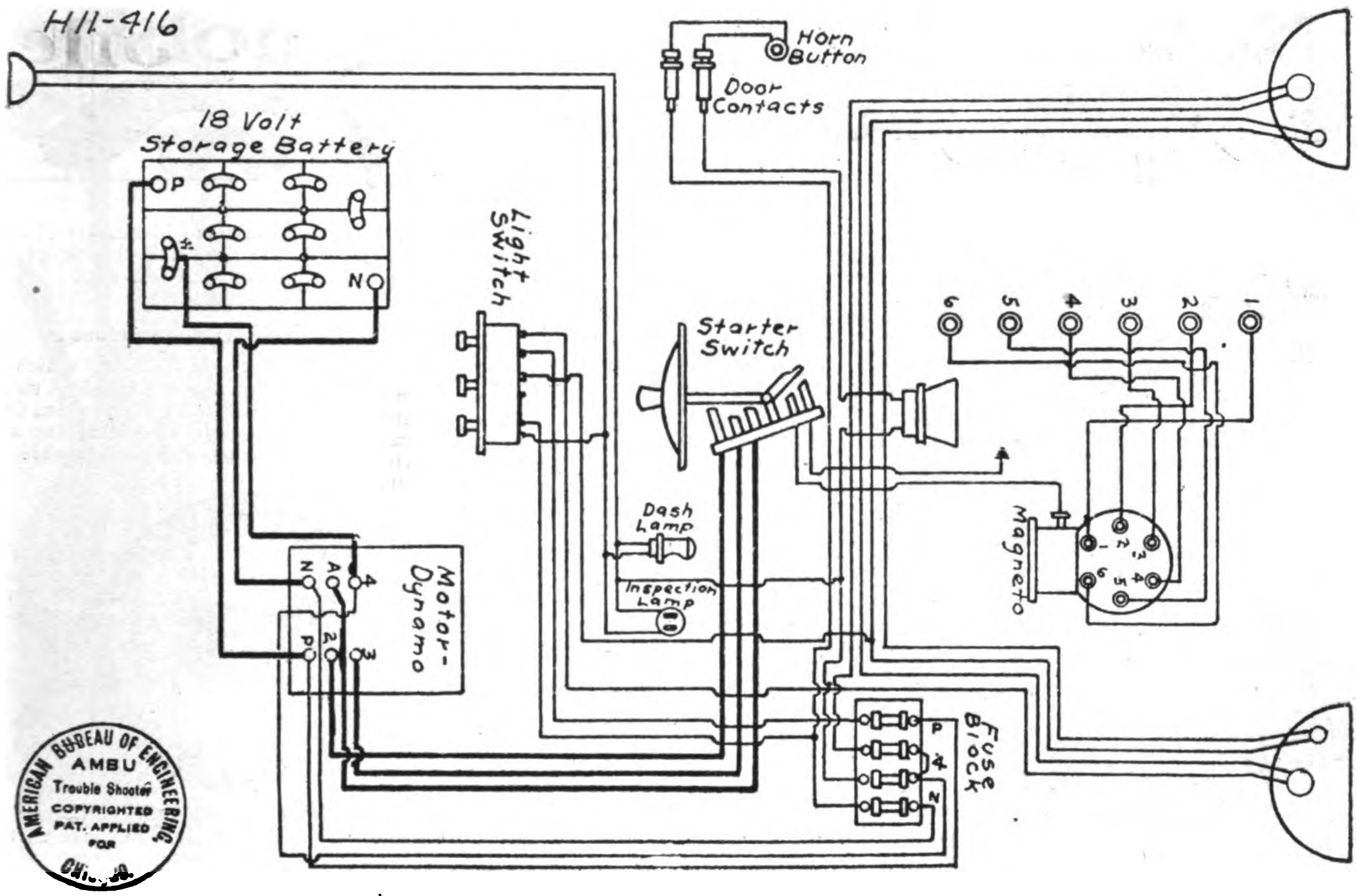
ENTZ Chalmers 1914 "24"



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If the engine still skips we would advise you to examine the ignition wiring throughout and be sure that there are no short circuits or grounded connections. Remove the cover from the distributor and clean it out.

If the trouble still persists, examine the points in the breaker box and see that they are not worn or pitted. These points should make a flat, firm contact with each other. Be sure that the spring is strong enough to snap the breaker points together.

We should advise you to change the spark plugs in the two cylinders with the plugs in the other two cylinders.

Wiring of a Chalmers Six, Model 24

2990

From W. E. J. Vinicombe, New York: Will you kindly print the wiring diagram of the Chalmers Six Model 24?

Reply: We print above the wiring diagram which you request.

Dry Cells on Overland 79

2991

From Earl J. Howland, Pennsylvania.—I noticed an inquiry in the February issue from Mr. Longenecker, in regard to dry cells in the Overland 79. The Overland 79 has a low tension magneto, consequently it starts on the dry cells after the starting switch is turned to the magneto.

The reason that practically all of the seventy-nines use dry cells is that some do not have generators and sometimes the battery would be out for charging, so that in order to start at all the dry cells were used. I have worked at a good many seventy-nine cars and all have had dry cells to start, but I believe it would be possible to start from the storage battery.

WOBBLY WHEELS

Wobbly wheels besides wearing bearings and otherwise racking the machine have an equally destructive effect on tire treads. A slight wobble of only one degree actually drags the tire side ways 920 feet in each thousand miles. This rasping increases with the seriousness of the trouble. Such a condition is easily corrected and saves not only tires but the car from excessive strain.—Miller News Service.

STOP! LOOK! LISTEN!

"Doggone it," said the disgusted motorcyclist to the village constable. "This signboard of yours says, 'Turn to the right here with trolley' and I've been waiting for thirty minutes and the darn thing hasn't come along yet."

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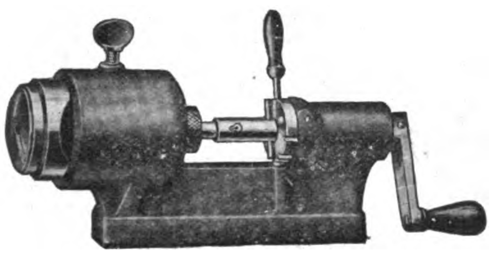
New and Useful Automobile Accessories

Newton Products

Any advantage to be gained by superior methods is indispensable to complete success. With this end in view the "Minute" Valve Grinder insures better results in grinding Buick valves. It is said to be a much easier and quicker way than is possible by the old hand method.

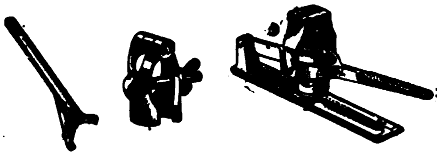
The cage and valve is held securely in Grinder and in alignment, and as valve is rotated it is automatically pushed out of grinding contact with the cage and this is done at irregular intervals so that the grinding contracts change and over-lap, resulting in a mechanically perfect ground valve seat.



Grinding is by spring pressure and does not depend upon the effort exerted by one doing the grinding. This insures better results and is the condition under which grinding compound should be used.

Extra bushing is furnished so Grinder will take both size cages.

Valve Grinder can be held in vise or a bracket will be furnished which can be fastened to bench with two wood screws.



The Rocker Arm Lever, Valve Cage Remover, Valve Spring Compressor and "Minute" Valve Grinder constitute a time saving Valve Grinding set for Buick. It is said that this set is a revelation to those who have already used it. It does away with all the old style bungling, troublesome methods and effects a real saving in repair bills.

The Valve Spring Compressor, car owners say "is worth its weight in gold." Of handy practical design and patented Nov. 30, 1920. It is for all Buick Valve Cages, including large ones 1918 and later.

The Valve Cage Remover, it is said, will remove any valve cage that is not so badly stuck that it must be forced out from beneath.

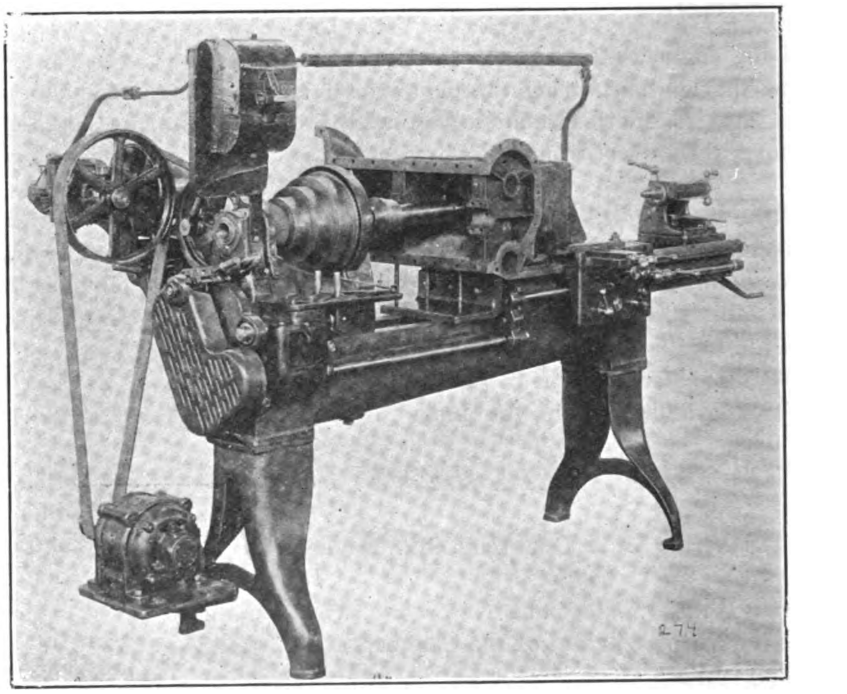
The Rocker Arm Lever is of ample length and at just the right angle to be convenient. It is used for tipping rocker arms when removing push rods or when testing valve spring and valve action. It is said that proper valve action and seating with this tool can readily be determined.

These time saving products are made by The Newton Manufacturing Company, Plainville, Conn. This company will be glad to answer all inquiries regarding their product. It certainly will pay readers to write for circulars and full information.

Cylinder Re-Boring Attachment

This attachment fits the 14-24-inch and also the former 15-22-inch Sliding Extension Cap Lathes manufactured by the Barnes Drill Co., of Rockford, Ill. As will be seen, the attachment permits of re-boring all sizes and styles of automobile cylinders. The work can be accurately done in this way, and after setting up the job, it requires less than five minutes to take a cut through a 4-inch cylinder, such as in the Fordson Tractor block shown. This eouipment eliminates investing in an expensive cylinder boring machine or grinder.

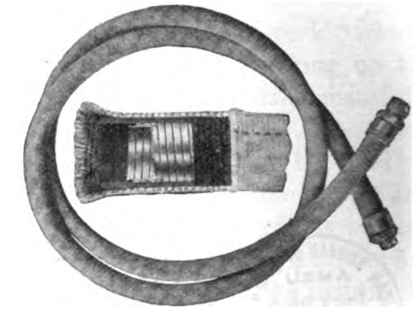
Attachment consists of an angle bracket to be clamped on carriage of the Gap Lathe, which bracket carries hardened bushing supplied for boring-bar; 2½-inch diameter boring-bar with Morse taper shank to fit spindle, high speed steel cutter, and draw-bolt through spindle for positive drive. Taper bushing, which slides into the old hole to assist in centering the cylinder, and supporting bolts for steadying the outer end of the cylinder are also included. These bolts screw into agnle shoe which slides along in the gap on the ways of the main bed.



By means of the sliding extension gap feature of these Lathes, cylinders of all shapes can be handled, such as the Fordson Tractor and Ford Automobile cylinder blocks. The Extension Gap Lathe is the most useful machine in the garage, and with slight additional outlay, this attachment and our Milling Attachment can be applied, making a universal machine for cylinder reboring, milling jobs, as well as for all kinds of lathe work. It would be impossible to apply this attachment to a standard 14-inch or 15-inch lathe because the cylinder block generally requires the extension gap.

Rex Tube Gasoline Hose

Rex Tube Flexible Tubing, which is manufactured by the Chicago Tubing and Braiding Co., 216 N. Clinton St., Chicago, Illinois, is said to be ideal for service station pumps, either portable or curb.



It is a three-in-one tube composed of steel, rubber and fabric. Because of this construction the manufacturers claim that it saves gasoline. Write to this Company for catalogue D, which covers features of this material fully.

Bus and School Bodies

The McKay Carriage Co. of Grove City, Pa., are manufacturing bus and school bodies for any type of chassis from the Ford to the Packard. These bodies are giving universal satisfaction and are being widely used.

The bodies are constructed in sizes to hold from ten to fifty passengers.

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Is this man saving your dollars?

Are you getting 100% service from your oxy-acetylene equipment?

Do you realize that the welding and cutting blowpipes will remake defective castings, rectify shop errors and cheat the scrap-pile?

An oxy-acetylene welded part is not reclaimed—it is *remade* and is ready for 100% service.

Prest-O-Lite
DISSOLVED ACETYLENE

in easily portable cylinders enables you to expand the use of oxy-acetylene, at will, to any department of your factory.

Quickly taken to any job, anywhere, the Prest-O-Lite cylinder supplies uniformly pure gas where and when it may be needed.

And Prest-O-Lite Service operating through forty plants and warehouses insures a constant supply of Prest-O-Lite Dissolved Acetylene at any time, anywhere and in any quantity.

THE PREST-O-LITE COMPANY, Inc.
General Offices: Carbide and Carbon Building, 30 East 42nd Street, New York
Balfour Building, San Francisco
In Canada: Prest-O-Lite Co., of Canada, Limited, Toronto

PW-510-21

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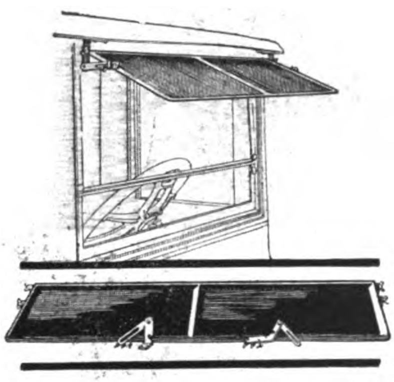
McKinnon Visor

The McKinnon Dash Company, 260 Amhurst St., Buffalo, N. Y., is manufacturing a new practical automobile visor, which is of great convenience to drivers in shading their eyes from the sun and preventing the windshield from becoming clouded from rain or snow.

The McKinnon Visor has several important features of construction. Its frames are of one piece electrically welded steel with no joints to shake loose. They are covered with fine quality artificial leather, beautifully finished—the upper side being black and the lower side green.



This Visor is easily attached and adjustable to any angle because of the slotted screw openings in its brackets. It is also removable altogether at will. Once adjusted, it is held firmly in place and will not work loose or rattle. The average weight of the McKinnon Visor is 3-3/4 pounds. It is made in four sizes, from 38 to 42 inches, and can be used in connection with any top construction or body design.

Keep Your Car Young

The S. E. Johnson & Son Company of Racine, Wisconsin, have issued a very attractive little booklet entitled, "Keep Your Car Young With Johnson's Car Savers." In this booklet are listed various products of the Johnson Company, all of which help in maintaining the automobile. The uses for the various compounds are given, and if used, undoubtedly will help to keep the car in fine condition.

The S. C. Johnson & Son Company will be glad to send to all readers of the Automobile Dealer & Repairer a copy of this little booklet upon request. Write for yours now, because the supply is limited.

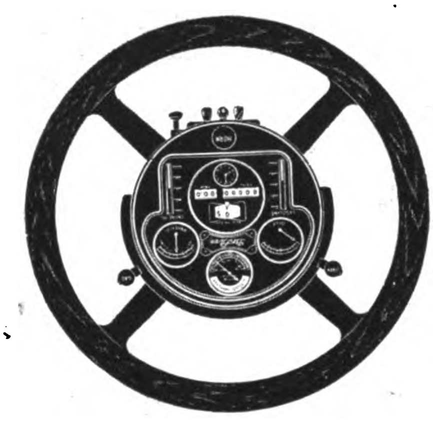
Whyte Motor Control

Mounted on the steering wheel, flush with the rim of the wheel, is a compact and unobtrusive unit containing the speedometer, oil gauge, ammeter, electric control switches, horn button or any other indicating mechanism that is standard equipment on the car. That such an arangement of the control mechanisms is convenient to the driver is obvious. With the Whyte Motor Control the driver need never let his eyes leave the road in performing any of the operations, and it certainly is advantageous to have all of the indicating mechanisms almost directly in his line of vision.

Heretofore the assembling and installation of all the devices has required much space in the factory and no little amount of time. The Whyte-Duffield Manufacturing Company will furnish Whyte Motor Control, the wheel and the post as a complete unit fully wired ready for installation.

From the standpoint of the repairman the new invention is also extremely convenient because it makes it easy to detect any trouble as all wires are easily accessible and the seat of the trouble can be almost instantaneously detected.

The offices of the company are located at 1250 S. Michigan Ave., and ground will soon be broken for the new factories which will be located in the Chicago Clearing factory district. It is expected that the factory will be ready for occupancy before the close of the year.



"Red Devil" All Steel Screw Driver

The all steel screw driver has many advantages, among which is the hollow handle combining strength and lightness.

This screw driver is drop forged, into two pieces, and the two pieces are welded

together. It is made from high grade steel, tempered in oil; its shape fits the hand perfectly, and does its work with the least amount of effort.

The handle is knurled, giving wonderful hand grip.

The end of the handle is slightly flattened and may be used for hammering, and the sides may also be used for driving, a combination which meets with great favor by motorists.

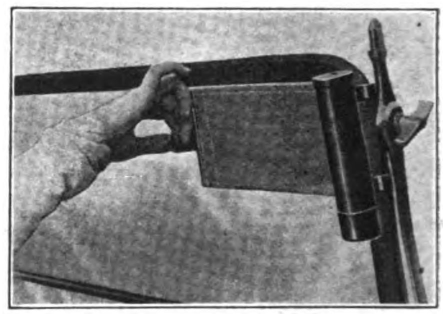
The "Red Devil" Screw Driver is sold under the fullest guarantee as to quality and finish, and it is intended that this tool shall stand rough usage. It is known as style No. 117.

The makers are Smith & Hemenway Co., Inc., Irvington, N. J.; manufacturers of "Red Devil" tools and hardware specialties.

The Auto Glare Shade

Nearly every car owner has come to the conclusion that it is necessary to equip his car with some sort of a sun shield. The Auto Glare-Shade, which is manufactured by the Auto Sunshade Manufacturing Co., 1237-30 So. Figueria St., Los Angeles, California, should be investigated by those who intend to purchase one.

This shade is contained in a small brass cylinder which the manufacturers claim is rust-proof, and to operate it, it is simply necessary to pull this glare-shade across windshield and hook it on to the L hook on the other side which is part of the equipment.



Flexo Lens Protector

The construction of the Flexo Lens Protector is as follows: A rubber gasket fits inside of the lamp rims. The inside edge of the gasket is deeply grooved. The edge of the lens fits into this groove. The lens does not come in contact with any metal. The soft, live rubber absorbs shock or vibration thus preventing breaking of lenses. The grip of the rubber is said to keep the lens from turning. It fits tightly under the rim so that water and dust cannot work through to rust or dim the reflector. The protector is equipped with a licensed and registered lens, upper half sand-blasted.

It is made in sizes to fit all automobile truck or motorcycle head-lights. It is also used for street car and locomotive headlights.

The device is manufactured by the Flexo Lens Protector Company, Camden, N. J.

Universal One-Piece Piston Ring

The feature of the Universal One-Piece Piston Ring which is manufactured by the Universal Machine Co., Baltimore, Maryland, is the beveled top edge and central groove which keeps the oil from the combustion chamber, thereby reducing the carbon.

It is said to prevent fouled spark plugs. Full details regarding this ring can be obtained by writing to the manufacturers.

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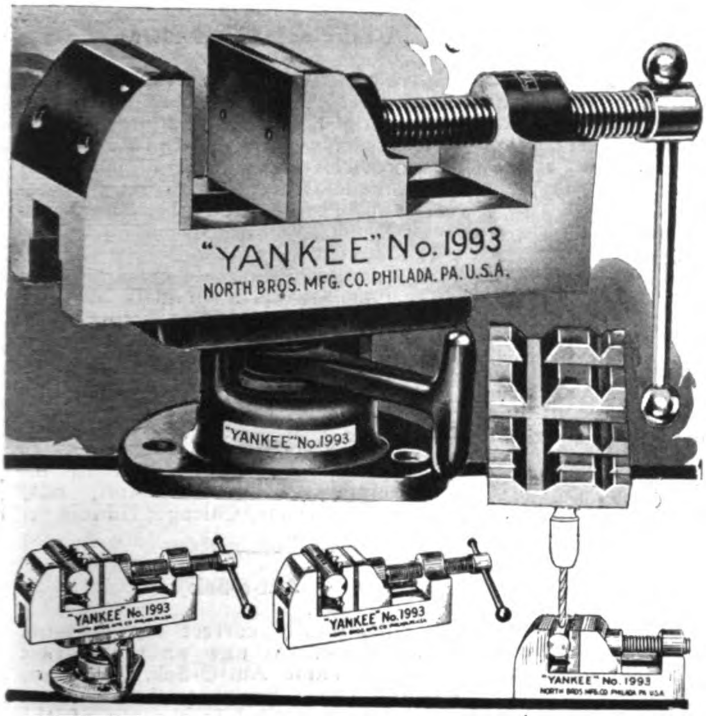

The "YANKEE" Vise assures accuracy from start to finish of a job

Work is locked in the vise at bench. The vise, with the work in it, is removed from its base and carried from machine to machine—through every operation.

Sides, ends, top and bottom of the vise are accurately machined to hold work square whether used flat or on sides or end. The work always retains the original alignment.

This means not only accuracy, but speed.

For many operations, the "Yankee" vise can be used as a jig.

The vise is quickly detachable from the swivel base by turning a set screw. The base has a cam-throw lever at the side which permits locking the vise in any desirable position.

Hardened steel block, with v-shaped grooves of various sizes, holds round or irregular work.

"YANKEE"

- Spiral Screw Drivers
- Quick-Return Spiral Screw Drivers
- Ratchet Screw Drivers
- Plain Screw Drivers, 1½ to 30 inch blades
- Ratchet Breast Drills
- Ratchet Hand Drills
- Plain Breast Drills
- Plain Hand Drills
- Ratchet Chain Drills
- Ratchet Bench Drills
- Automatic Push Drills
- Ratchet Tap Wrenches
- Bench Vises—without base
- Bench Vises—Removable Swivel Base

"YANKEE" VISES

No. 1993—Body 7¼ in. long, 2¾ in. wide: 3 in. high over all. Jaws open 3⅛ in.

No. 993—Same as No. 1993 but without swivel base.

No. 1992—Body 4⅝ in. long, 2 in. wide; 2 1/16 in. high over all. Jaws open 1 15/16 in.

No. 1991—Body 3⅝ in. long, 1½ in. wide; 1½ in. high over all. Jaws open 1½ in.

Dealers everywhere carry "Yankee" tools. Everybody who works in wood or metal should have the "Yankee" Tool Book—mailed FREE upon request.

North Bros. Mfg. Co.
Philadelphia, Pa.

"YANKEE" TOOLS

Make Better Mechanics

THIS MONEY-SAVING Instruction Booklet---FREE

TELLS YOU HOW

To remove carbon yourself.
To mend radiator leaks.
To lubricate springs so as to prevent breakage.
To keep body, hood and fenders looking like new.
To make old, gray, dusty tops and curtains look like new.
To revarnish your car yourself any Saturday afternoon.
To grind valves
To mend your own tubes and casings.

You can easily and satisfactorily do all these things yourself with *Johnson's Car Savers*. The saving will run into hundreds of dollars

Ask your accessory dealer or garageman for a copy of the Johnson Booklet entitled "Keep Your Car Young." If he cannot furnish it fill out and mail coupon.

JOHNSON'S Car Savers

Johnson's Carbon Remover—an easy, clean, safe and satisfactory remedy for carbon. Will save you $3.00 over other methods and without laying up your car. You can do it yourself in ten minutes—without even soiling your hands—cost is trifling. Half-pints, 75c.

Johnson's Black Lac—the perfect top dressing. Easy to apply—dries in fifteen minutes—is permanent, waterproof and inexpensive.—Half-pints, 75c.

Johnson's Auto Lak—enables you to revarnish your car one day and drive it the next. Pints $1.00.

Johnson's Cleaner—for body, hood and fenders, Removes spots, tar and alkali—preparing the surface for a polish. ½lb. cans, 45c.

Johnson's Liquid Wax—the dustless polish for body, hood and fenders. Imparts a hard, dry, gas-like polish. Half pints, 50c.

Johnson's Stop-Squeak Oil—penetrates between the spring leaves, thoroughly lubricating them. Reduces liability of spring breakage. Half-pints, 35c.

Johnson's Radiator Cement—seals leaks in two to ten minutes—in liquid form and easy to use. No experience or tools required. Half-pints, 75c.

S. C. JOHNSON & SON, Racine, Wis.

S. C. JOHNSON & SON, Dept. AD. 5, Racine, Wis.

Please send me free your Instruction Booklet on keeping Cars Young. I was unable to secure it from this dealer.

Name ....

Address ....

City and State ....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

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Kork-Tred

The Katta-Pilla Metal and Cork Belt, which is manufactured by the Kork-Tred, Inc., 500 Fifth Avenue, New York City, is one for which it is claimed that it does not slip or stretch. It is made of thin steel links, fibre pins and corks. The manufacturers claim that it is noiseless and unaffected by dirt, water, heat or oil.

The manufacturers are making a special offer of a set of Kork-Tred Ford Transmission Lining and a K-T Fan Belt for the price of a set of lining. This offer is surely worth while taking advantage of, and readers should consider it.

New Pedal Shackle

A shackle which is made of hardened steel (nickel plated), is file and hacksaw proof, and when placed around the three pedals of the Ford car brings the reverse pedal up in line with the clutch and brake pedals, is being manufactured by the Pedal-Shackle Company, 4620 St. Andrews Place, Los Angeles, California.

It can be locked at the end by any made of padlock that has a one-quarter inch hardened staple which makes it hardened material throughout. The manufacturers claim that it is as near thief-proof as it can be made. Full details regarding this ingenious device may be obtained by writing to the manufacturers.

Replace Curtain Lights

A large percentage of the unsightly tops which we see today might be rendered presentable were the window lights restored. A broken window is as unsightly as an unpainted house. The Replace Light Mfg. Co. of 2308 Sixth Avenue, Rock Island, Ill. are marketing a replace curtain light which should be of interest because the product may be obtained in many styles for practically all makes of cars.

The Replace lights are of clear, transparent sheeting which is flexible and is said to withstand wear and weather. This sheeting is stitched into frames of material to match the top fabric. The lights are attached by means of clip fasteners and require no stitching. This company produces a light under the name of "Bevelite" which has the transparent sheeting embossed to imitate bevel glass. Bevelite is mounted in a 5/8 inch nickel plated frame and is attached by means of nickel fasteners.

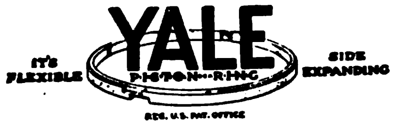
Radiator Funnel Cap

The Radiator Funnel Cap Company, 3852-54 Grand Boulevard, Chicago, Illinois, is manufacturing a very desirable device, called the "Radiator Funnel Cap." This is made of heavy aluminum, highly polished and consists of two principal members, a funnel and a base upon which the funnel swivels.

It is screwed in to the top radiator and becomes a stationary fixture. It is said to combine a stationary filler cap and overheat indicator, a radiator cooler and a practical funnel. Its appearance is certainly more attractive than the ordinary cap, and it should enjoy a wide popularity.

Yale Piston Ring

A flexible ring which is claimed to conform to the shape of a worn or out-of-round cylinder is manufactured by the Yale Piston Ring Company. The sales office of this concern is located at 209 West 76th Street, New York City.



The ring is composed of two thin pieces of metal. The steel inner member is claimed to furnish a live flexible spring thereby expanding the soft cast iron outer member against the cylinder wall. Readers who are being troubled with oil and compression leakage will do well to investigate this ring.

Carbon Pick

A small handy ignition tool, which it is claimed cleans spark plugs, is manufactured by the Globe Tool and Manufacturing Co., 2605-7 Stephenson Avenue, Los Angeles, California. This is a handy little tool which can be carried

in a pocket-book or on a key ring. It is a combination carbon scraper, spark plug and magneto file, spark gauge and magneto gauge. It is very reasonable in price and more than pays for itself in service.

American Visible Curb Pump

A new five-gallon single acting quick return visible pump is being placed on the market by the American Oil Pump & Tank Co. of Cincinnati, Ohio. This pump is a very desirable machine. It is extremely accurate, measuring and discharging a mechanically correct five gallons.

The other features of this device make it one which should appeal to our readers and we should advise them to write for literature regarding it.

Roller-Smith Products

The Roller-Smith Company, the main office of which is at 231 Broadway, New York City, has changed the names of its three and one-half inch and four-inch D. C. Ammeters and Voltmeters. These devices have been on the market for many years and are widely known and used.

The manufacturers have not changed the instruments in any way except to add refinements. The Roller-Smith "Junior Imps" are now known as type TID and the four-inch Imps are called Type FID. This Company manufactures a full line of electrical instruments, meters and circuit breakers, and has offices in the principal cities of the United States and Canada. Their bulletins B-400 and B-410 are very interesting and helpful. It will be to the advantage of readers to send for them.

Red-I-Fit Foot Rest for Ford Cars

In this issue of our magazine we are printing for the first time an announcement of the Red-I-Fit Foot Feed which is manufactured by Heaton-Ault, 6247 Greenwood Avenue, Chicago, Illinois.

The manufacturers state that this device fits all Ford cars, and is a great convenience for any Ford driver.

This invention is simple; it can be easily installed by merely changing two cotter pins. It fits all models of Ford cars from 1910 to, and including 1921. With this device installed one can make sure that the accelerator will work all the time, and it will give the car that easy and positive motion which is very desirable.

See this advertisement for prices, or write for fullparticulars direct to the manufacturer, Heaton & Ault, 6247 Greenwood Avenue, Chicago, Illinois.

Aut-o-Sek

A scientifically correct top dressing for automobiles is now on the market under the name Aut-O-Sek. It seems that top fabric begins to break down even before installed in the top of the car, through the drying out of the oils and the difference in contraction between the coating of the top and the backing layer. Aut-O-Sek penetrates and lubricates the fibre of the top material, preventing deterioration and prolonging its life indefinitely.

Aut-O-Sek on old cars covers and waterproofs all cracks in addition to giving a rich, black lustre-like-new top. Aut-O-Sek will not check nor peel. It is wiped on the top with a rag and a quart is enough for a five passenger car. It is manufactured by Sek Mfg. Company, 2750 W. Madison Street, Chicago, Ill.

Little Giant Split Rim Tool

Car owners who have been troubled with having the rims battered up with a hammer and pinch-bar would do well to have this work done in a shop which is equipped with a Little Giant Split Rim Tool.

This tool is said to expand or contract any car rim, just by a few easy turns of the crank. The castings are made of malleable iron and the screw is square-threaded. The Y is of unbreakable steel and the stand is rigid angle-steel. The entire device occupies very little space and it more than pays for itself in time and labor saved.

It is manufactured by the Marquette Manufacturing Co., St. Paul, Minnesota. This concern has an Eastern office at 51 East 42nd Street, New York City.

Niehoff Issues New Catalogue

One of the most beautiful catalogues that has ever come into our office, has been issued by Paul G. Niehoff & Co., 232-242 East Ohio Street, Chicago, Illinois. This catalogue No. 6, however, is not only beautiful, but practical. All of the smaller items are shown in actual sizes and altogether the entire line is illustrated in a very attractive manner.

The back of this book contains some very helpful data relative to ignition replacement parts, starter and generator brushes and electrical testing instruments and equipment.

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Oil Control and Compression In Each Individual Ring


THE ONLY GROOVE THAT CANNOT CLOG

The original, patented, "oilSEALing" angled groove of the No-Leak-O Piston Ring fills with fresh oil and empties on each stroke, giving proper oil control and maintaining a non-leaking, oil seal between piston and cylinder wall. When reversed in the top groove of each piston it keeps kerosene and unvaporized gasoline out of the oil pit.

Another No-Leak-O feature is the patented casting process that insures equalized pressure on cylinder walls.

With these two patented features No-Leak-O Piston Rings give Oil Control and High Compression in each individual ring.

They are made in one piece—easy to install—individually tested and guaranteed for accuracy—made of finest material—guaranteed against breakage. They combine high efficiency with low cost.

QUICK SERVICE

You can secure No-Leak-O Piston Rings in any standard size and many oversizes from your nearest jobber or dealer. Over 200 jobbers stock No-Leak-O. If yours does not send us his name and address.

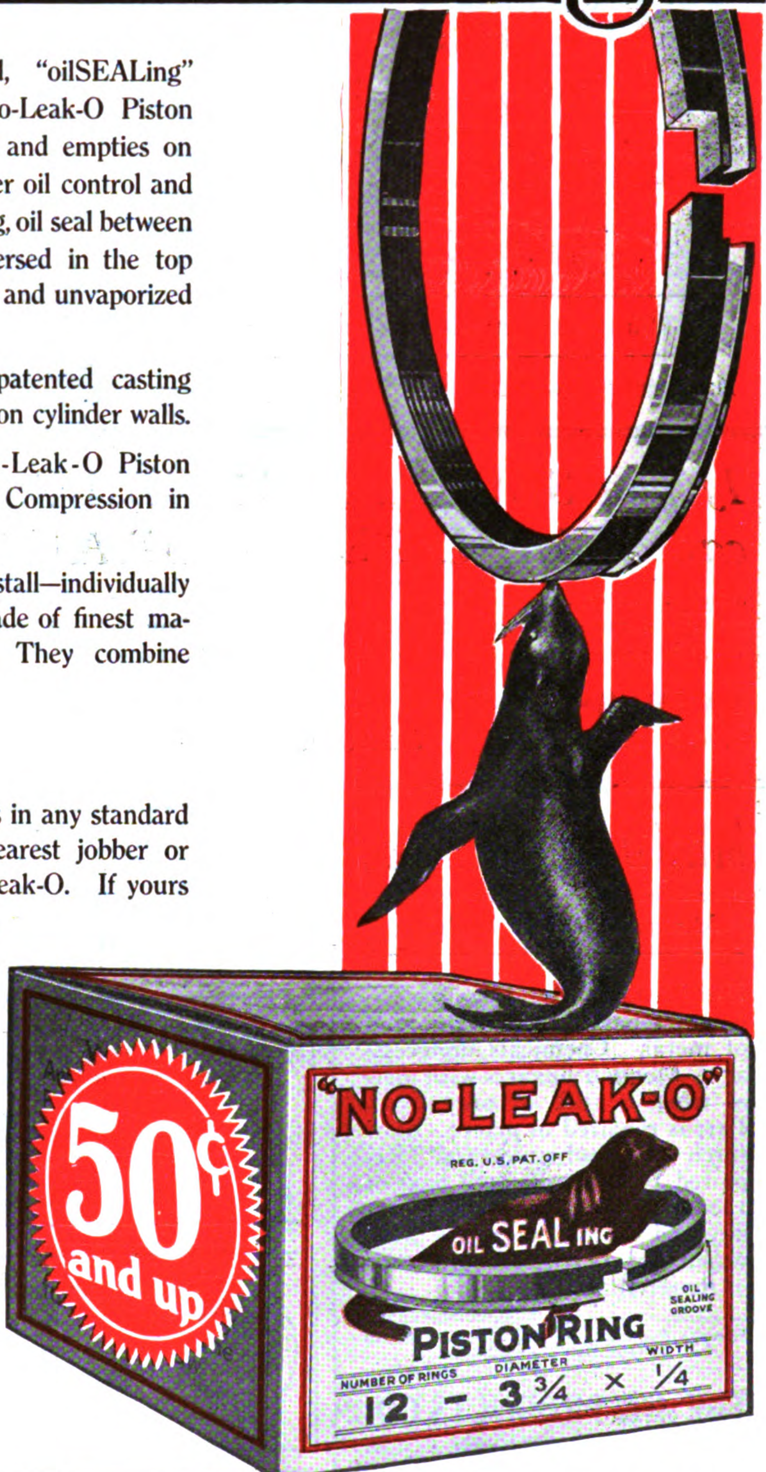
PRICE 50c AND UP

FREE LITERATURE

Write us today for free booklet "The Piston Ring Problem and Its Solution." Also price list and special offer to the trade. Let us tell you how to "cash in" on our 1921 Saturday Evening Post Advertising. WRITE TODAY.

IMPORTANT: In buying Piston Rings insist on the genuine No-Leak-O with the original "oilSEALing" groove, packed in this standard package bearing the famous ring and seal, our registered trade mark.

NO-LEAK-O PISTON RING COMPANY
BALTIMORE MARYLAND



NO·LEAK·O Piston Rings
WITH THE ORIGINAL OIL SEALING GROOVE

AUTOMOTIVE EQUIPMENT ASSN.

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MEND AUTO CURTAINS
INSTANTLY

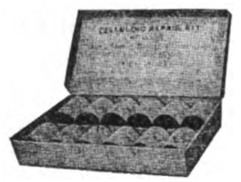
Also Motor Boat Curtains or any other articles made of celluloid, by using

BINGO THE WONDERFUL CELLULOID REPAIR KIT

A new discovery, affording the greatest convenience known to motorists. Simply apply it to small piece of celluloid, place over crack, press tightly and repair is permanently and instantly made, no waiting to dry.

Demand Spreading Like Wild-fire---Orders Pouring In

Nothing like it on the market. Everyone wildly enthusiastic. A child can use it. Once repair is made it can never come apart. No more ragged, unsightly curtains. No more cold or storm beating through. Neat repairs easily made, that are hardly discernible. Price, per bottle including celluloid roll, $1.00. Order Today. Circular Free.



Write for Attractive Agents' Proposition

Manufacturers' Distributing Co., 210-211 Lincoln Bldg., Detroit, Michigan.

If you SELL AUTOMOBILES *you can* SELL LIFE INSURANCE--

Some of our agents cleared above $10,000 last year. Best territory open. Very liberal contracts. Popular policies. The Farmers National Life has $1.75 of admitted assets for each dollar of policy liability. Write at once to

FARMERS NATIONAL LIFE INSURANCE CO.
F. N. L. Building CHICAGO, ILL. 3401 Michigan Ave.

MENDALL METAL

Mends Without Welding

Use Mendall Metal to permanently repair cracks in any kind of metal. Chemicals unnecessary. Mendall fluxates with metal when heated to only 250°. Part is repaired in place. Blow torch only tool necessary. Repaired part stands 600° heat or 1200 lbs. pressure. Write us today and learn how to do $100 worth of work with only $5 worth of material.

Sample Package —— Six Bars —— $5.00
One Bar —— $1.00

THE 4-A PRODUCTS CO.
Dept. D.R. DENVER, COLO.

AKRON-WILLIAMS
TIRE REPAIR EQUIPMENT

Turns out perfect work the first time. No more "second time" jobs. Saves money, material and time. Perfected on the experience gained in equipping thousands of tire factories and tire repair businesses.
Write for Catalogue

The WILLIAMS FOUNDRY & MACHINE CO.
Everything for the Tire Building and Repair Man
AKRON, OHIO

Forty Thousand Dealers
ARE SELLING
BENFORD'S
Golden Giant Spark Plugs
GET YOUR STOCK READY!

PROFIT PRODUCERS FOR FORD CARS
Precision Top Converter
Krom-Nik Anderson Special Ratio Gears
F. & H. Roller Bearings.
Write today for full details
FULTON-HOUSTON CO., 1148 Mich. Ave., Chicago, Ill.

JOSEPH N. SMITH & COMPANY S DETROIT
Automobile Hardware
DoorLocks Handles
Door Hinges Mouldings, etc.
JOS. N. SMITH & CO.
Detroit, Mich.

The man who does not advertise because he doesn't know how to write an advertisement should quit eating because he can't cook

Bailey Whirling Atomizer

The Bailey Whirling Atomizer which is manufactured by Asch & Co.. Inc., 16-24 West 61st Street, New York City, consists of a whirling three-bladed fan reinforced by six arms, each arm being in a different plane. This, it is claimed, breaks up the globules of gasoline making a perfect mixture possible.

The manufacturers claim that this saves gasoline because all of it is vaporized, thereby making a uniform mixture in all cylinders. The device is easily attached and fits between the carburetor and manifold. Full information can be obtained by writing to the manufacturer.

Super-Coil Units

The special features of the Super-Coil Units which are manufactured by the New York Coil Company, 338 Pearl Street, New York City, are such that they should be of special interest to the Ford owner.

It is claimed that the extra long-lasting contact points practically eliminate adjusting vibrators. The manufacturers also say that the improved lightning-fast vibrator produces a shower of flaming sparks, thereby insuring the utmost power, greatest gasoline economy and smoothest engine operation. They are especially desirable because of the fact that they fit right in the regular Ford coil box.

Penberthy FloMeter

The Penberthy FloMeter is a device which can be fitted to the instrument board and which tells the actual amount of gasoline that is being consumed at any moment of reading in gallons per hour. The advantage of a device of this sort can readily be realized when it is remembered that one can adjust the carburetor to the most efficient setting by screwing the adjustment one way or the other, until the speedometer shows the maximum number of miles and the FloMeter registers the minimum amount of gas.

This device is manufactured by the Penberthy Injector Company, Holden Ave. & Grand Trunk Railway, Detroit, Michigan.

The Benzer Rear View Wind Deflector

The Benzer Rear View Wind Deflector is especially designed to protect the occupants of the car from wind, rain and dust, and, as will be noted from the illustration, upon each wing there is ground a rear view mirror, which enables the occupants of the car to see the rear on both sides while driving. The glass is 1/4 of an inch thick, with 1/2 inch bevel; the fittings are made of steel and aluminum that cannot rust.

They will fit any car, are adjustable to any angle, and the installation is very simple. They are absolutely guaranteed not to rattle, and are made in all sizes for all cars. Being easily adjusted, they can be used as ventilators in the summer, to direct breezes into the car. The manufacturers will supply free to dealers, literature, sign and display equipment.

The manufacturers are The Benzer Corporation, Myrtle and Cooper Avenues, Brooklyn, N. Y.

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Contents

Rhymed Dope

They say that a woman's as old as she looks; a man is as old as he feels;
Permit me to add, then, kind friends a remark, "a Ford is as old as its squeals."
It's not my intention to play upon words, or to make from a fact a poor pun
But when a Ford knocks and has rattles galore, the span of its life is near done.
'Tis said that a gallon of water or less if dropped with a consummate skill,
On the head of a person directly below, is practically certain to kill.
And so 'tis with cars and with engines and Fords, with springs, wheels and axles and such.
'Tis not just *one* tap, or *one* squeak, or *one* knock that matters so *terribly* much,
'Tis the aggregate taken day in and day out of many small things in a bunch,
That cripples the car and makes it a wreck and gives it the sure "knock-out" punch.
A gentle, smooth sound means peace and content, like the purr of a satisfied cat,
But beware of the grunts and the knocks and the coughs and the damaging rattle-tat-tat.
The voice of your Ford, if you understand cars, expresses a meaning so plain,
That if you ignore it and let it squawk on, your pocketbook suffers a pain.
You have senses five and use for them all; then work them in driving your car.
The exhaust tells your nose a tale of its own, as plain as a five cent cigar.
Electrical current is tasted with ease, but limit your taste to six volts.
Your eyes you can use for millions of things, your fingers for tightening spokes.
Then why slight your ears, they are handy enough, you can trace out a bump or a knock,
A broken main bearing, a tappet that's loose, or even the tick of a clock?
Eliminate all of those squeaks and those knocks, don't let them remain for an hour;
Your car will last long after others have died, and give you its due share of power.
I've tried in this rhyme to make myself clear, I trust that my meaning is plain;
The large things of life take care of themselves—'tis the small things that cause all our pain.

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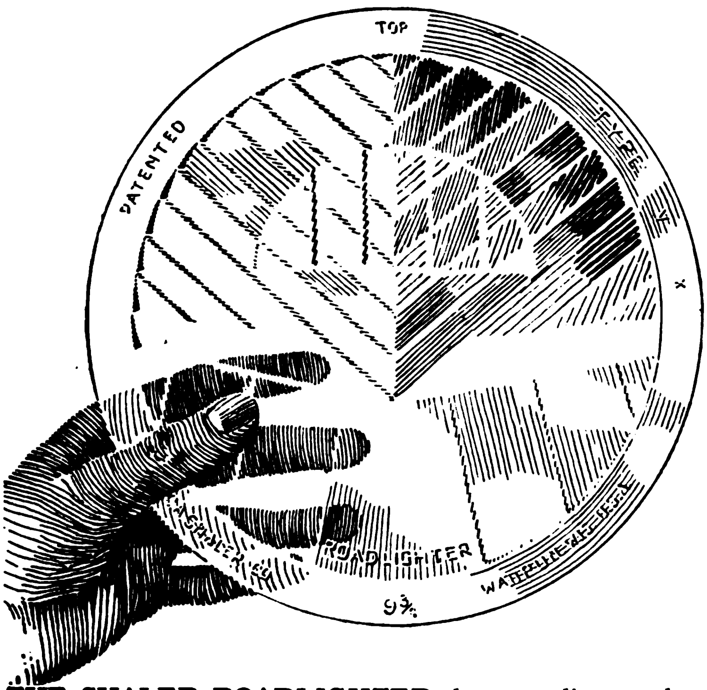
Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 71-73 Murray Street-New York City

Entered as Second Class matter January 15, 1921 at the Po st Office at Cooperstown, N. Y., under Act of March 3, 1897

Vol 31. No. 4. JUNE, 1921 Monthly $1.50 per Year Single Copy 15 Cents



SHALER

ROADLIGHTER

Gives a Better Driving Light than Plain Glass or Any Other Lens

THE SHALER ROADLIGHTER does not dim, weaken or diffuse your driving light---it controls only the glare rays and distributes them on the road. It strengthens the distance light and spotlights the sides of the road with such an intense light that the user is protected against the glaring lights he meets.

Proved Best in Every Official Test

Every state which makes official tests has awarded SHALER Roadlighters the highest candle power rating. The SHALER is the only lens that has passed highest in every test. It has been approved by states, cities and police—and is legal everywhere.

Don't wait for the police to compel you to have a better driving light. SHALER Roadlighters will not only give you a safer light for night driving, stop all glare from your headlights, give you a better light than with plain glass, but protect you against other people's glaring headlights.

SHALER Roadlighters are made in all sizes to fit all types of headlamps, and when properly adjusted light the whole road with a powerful, intense light, which penetrates darkness, fog, dust, and even the glare of apppoaching headlights.

Sizes 8¼ inch and smaller, price $2.75 a pair. Sizes 8⅜ inch and larger, price $3.50 a pair.

Each package contains complete instructions for installing the lenses and adjusting headlamps.

DEALERS:—Write for Trial Offer and Free Book, "Making Light of Glare"

C. A. SHALER CO., 805 Fourth St., Waupun, Wisconsin

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Complete Piston Ring Service

Instead of bothering with a variety of piston rings—known and unknown— you can now meet all your requirements with *one profitable, quick selling line—the Star-K.*

THE STAR-K INLAND is premier among high class piston rings. One piece, spirally cut and specially heat treated, it uncoils like a spring against the cylinder walls, producing a gas tight, oil tight, fit, snug but not binding. The overlapping ends being flexible, these rings readily adjust themselves to irregularities in the cylinder, and their value becomes apparent in absence of oil in compression chamber, less carbon, more power, greater mileage per gallon of gas. And this satisfactory condition lasts because, by uncoiling, Star-K Inlands "follow the wear."

THE STAR-K OILESS is a popular priced ring of remarkable quality. Note these features:

Price, 50c and up, depending upon size.

Oiless because of the double-groove feature—one in middle for lubrication; one on lower shoulder to scrape down the oil. The step joint prevents leakage through the ring.

Quick-Seating because of the velvet finish of the contact surface that causes the ring to "wear in" quickly, producing maximum efficiency in the shortest possible time.

Stock the complete Star-K profit making line.

★K

OTHER STAR-K PRODUCTS

Star-K "Breather" Spark Plugs.
Price, $1.50 each

Star-K Shurnuff Grease Retainer for Ford Cars.
Price, $.90 eabc.

Star-K Shurnuff Ventilating Windshield for Ford Cars.
Price, $7.50 each.

Star-K Shurnuff Combination Manifold for Ford Cars.
Price, $9.00 each.

Star-K Shurnuff Running Board Supports for Fords.
Price, $3.90 per pair.

For Further Particulars. Write Us

STAR-K INLAND

ONE-PIECE PISTON RINGS

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SPEED DOWN HILL

A SHORT time ago someone asked me what could be done in case the brakes on a car suddenly refused to work while the car was going down a steep hill. A crude humorist might answer this question by advising the driver, in such a case, to turn the horn on full force, hope for the best and steer the car as efficiently as possible, consistent with the speed and the terror of the driver. But the question is a logical one and deserves careful consideration.

A speed of thirty miles on hour on level ground is nothing to become excited over. In fact it is fair to say that most drivers are accustomed to even higher speeds. But when your car starts down hill at a thirty-an-hour clip and you realize that there is no means at your disposal to check the speed, should you need to, then your stomach starts to play tag with your tonsils; your heart pounds against your ribs so rapidly that it stops your watch; and your eyes stick out from their sockets so far that they almost hit the windshield.

People often talk about how they felt when they were on the point of drowning. How they reviewed the mean things they had done in their wicked past, even going so far back as the time when they put the tacks on the school teacher's chair, much to that gentleman's discomfiture and to your pain and sorrow. But this is as nothing, compared with that of sliding down hill on an automobile which has lost its sense of discretion. At such times one recalls even the sins of infancy and the days when, creeping upon the floor, one was prone to pick the wings from flies and torture the unwary spiders. There's nothing like a rapid trip down hill in an uncontrolled car for reviewing ancient history.

I'll never forget the time when I had an experience with a car which did not have any brakes and whose differential forgot its function. It was between Westerly and New London, Connecticut, that I was subjected to the ordeal and any of the readers who have gone over the old Post road between these two cities knows that the hills are man-sized affairs and are always located around corners. I had a friend with me who was not as familiar with automobiles as he was with horses. Before he took the trip with me his maximum speed had been limited to that of one of his work-horses. Henry was loath to travel in my horseless carriage and was uneasy as soon as the speedometer had approached the 15 mark.

Early in the day I had occasion to repair one of the brakes on the car and in my zeal I had smashed the brake band so that it did not function at all. The other brake operated on the transmission which is an open confession that I was driving the Nation's most popular car.

We were traveling along at a very moderate speed when we rounded a corner and without warning the road dropped from beneath us. Offhand I should estimate that the grade might be classed as 100 per cent pure. Within the space of two ticks our speed accelerated to 35 miles an hour and I began to hope for good luck as I applied the transmission brake.

Fortune merely smiled for a second as my brake took effect, then she let out a shriek of hate as the differential smashed and my car rolled downward with nothing to check its speed. We went faster and faster until the telegraph poles seemed to form a solid board fence on

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one side and my heart came up into my mouth to see what all the fuss was about. I could see no need for blowing the horn because Henry's howls of terror would have drowned the noise entirely.

We missed a wagon load of wood by the fraction of a hair and finally reached the bottom of the hill at a speed too high for estimation. As soon as the car had lost some of its momentum Henry left it by the back way and though he rolled along at a fair speed he could not seem to keep up with the car. A mile or so further on the car stopped and I hopped out to rest. When Henry finally caught up with me he refused, absolutely, to get into the car again and he rode home on the back of the horse which we hired to pull the car.

Since this incident I have often thought of the various things I might have done had I thought of them in time and some of these things form the basis for this article.

The car speed is controlled, under normal conditions, through the clutch and the change gears. The car speed may be checked either through the gear box or by the brakes. If both the brakes and the gears between the wheels and the engine are inoperative then not much can be done to stop the car if the machine is running down a hill.

The control of the car through the gears is not as easy as it seems at first thought. It would be fairly easy if the proper gears could be meshed but in an emergency and with no warning, it is a difficult matter to change from high to lower speeds unless one knows how.

Construction of Transmission

To understand the conditions let us review the construction of the machine from engine to wheels. When the gears are in low speed the power from the engine passes through the clutch to the gear-set where a driving gear is meshed with a second gear, which in turn is meshed with a third and from there the power passes to the rear axle and the wheels.

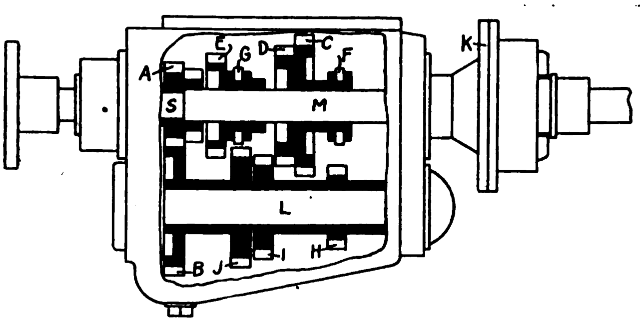

Fig. 1. Location of Gears at the Neutral Position in the Gear-Set

For purpose of making the matter clear let us assume that the gears in the gear-set have teeth as follows. The driving gear has ten teeth and meshes with a driven gear having twenty teeth. It is plain to see that the driven gear will travel only one half as fast as the driving gear. The driven gear is keyed to the third gear which has ten teeth and this in turn meshes with the gear on the propeller shaft which has twenty teeth. The gear on the propeller shaft, then will run one half as fast as the second gear or one quarter the speed of the driving gear connected with the engine. This means that the propeller shaft receives four times as much power but ¼ the speed of the original driving gear.

In the rear axle the speed is still further reduced and the power likewise increased in about the same ratio. Generally speaking we may assume a three to one reduction at this point which finally results in a total speed reduction between the wheels and the engine of 1-12 and

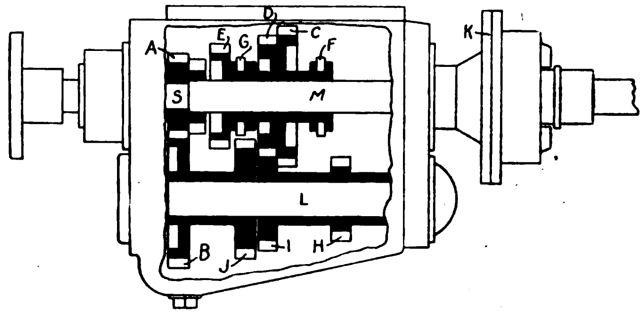

Fig. 2. Gears D and I are Meshed for Low Speed

an increase of nearly 12 times in the power.

The reader must realize that there is no increase in actual horse power by this gear system. The engine delivers a certain amount of power and this takes into consideration the "twist" as combined with revolutions per minute. Our meaning of the word "power" is the generally accepted meaning, that is the twisting effort of the revolving shaft.

If an engine gives a certain amount of "twisting" power at 1000 revolutions per minute it will give twice as much "twist" if the revolutions are cut one-half by gear reduction. (There is a loss, by friction in all gearing but we need not consider it at this time.)

The main thing to understand is the fact that power is obtained by reduction gearing, at the sacrifice of speed. When the gears are in "high" the propellor shaft travels at engine speed and the reduction is only in the rear axle.

From this it can be seen that when the car is moving, the gears for the various speeds, in the gear-set, are traveling at various speeds. If the car is running in "low," then the immediate gear is running slightly slower than the engine and the high gear is running very much slower than the engine.

In order to change the gears from low to intermediate, then, without grinding or clashing, the engine speed, or rather the speed of the clutch shaft, must be diminished. The driver seldom needs to worry about these conditions because the clutch speed automatically drops as soon as it is released for changing the gears.

Conditions at High Speed

But when the car is traveling in high speed the conditions are entirely different. In this case the intermediate gear is running faster than the engine and the low gear is running at a very much higher rate of speed than the engine. To mesh the lower speed gears it will be necessary to speed the clutch member to equal that of the gear which is to be used.

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In order that the driver may know just how fast the engine should run in each speed he should drive his car, on level ground, first in low gear, then in intermediate and in each speed note how fast the engine must run to give certain car speeds. He should practice the changing of speeds from high to intermediate and then to low, when the car is traveling at various rates along level ground and then when an emergency arises, he will be able to drop into the lower speeds.

In order to make this drop it is necessary to speed the clutch member between the changes. For example let us assume that the car is running in high gear and the driver wishes to drop back to intermediate. If the car is coasting along on level ground, or down grade and the engine is not doing work the gears may be thrown to neutral without throwing out the clutch. This should be done with a quick motion in order not to grind the gears.

As soon as the gears are at neutral and the clutch engaged the engine should be speeded up and the clutch thrown out, then the intermediate gears may be meshed. If the gears grind it usually means that the clutch speed is not high enough. Let the clutch pedal back for a second and speed the engine again, then throw out the clutch and try to engage intermediate.

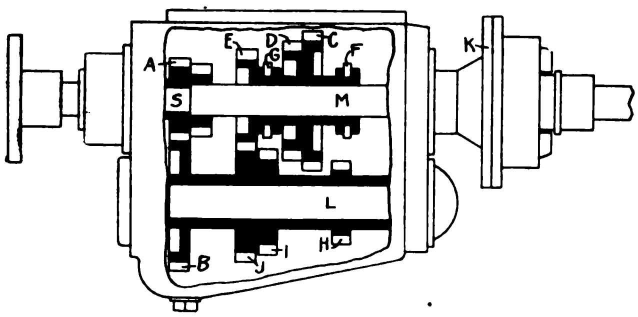

Fig. 3. Gears E and J are Meshed for Intermediate Speed

In an emergency, where the car is running down a steep grade and the brakes do not work properly, it is permissible to make all of the changes without throwing the clutch pedal off. It is merely a matter of adjusting the engine speed to that of the driven gears.

It often happens that the emergency brake is inoperative and that the service brake is the only one available. The driver suddenly finds his car on a steep hill and the grade is such that the service brake is inadequate, yet it does check the car somewhat. Obviously, to remove the right foot from the service brake to touch the accelerator in making the change downward as suggested above, would be foolhardy. While this was being done the car would attain considerable momentum and perhaps it would run so fast that the engine speed could not equal the driven gear speed. In such case the left foot can be used to advantage on the accelerator and the clutch entirely ignored.

To make such a change, without operating the clutch, requires a bit of skill, else the gears will be stripped, but if care is used and the driver is wise enough to get in a little practice before the emergency arises, he can change the gears smoothly and without damaging them

We will assume, again, that the car is descending a hill in high gear. He finds that his service brake helps to check the speed but realizes that even so, the speed constantly increases. He must get the gears into a lower speed and use the engine as a brake.

Without releasing the service brake, throw the gears

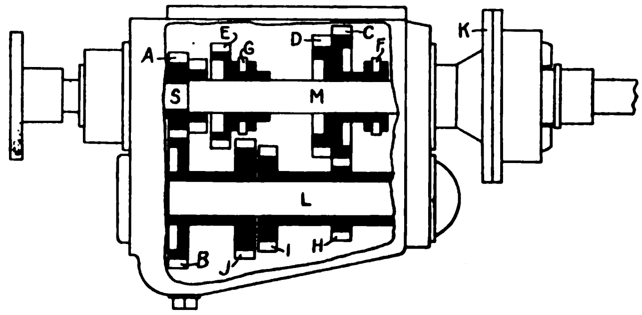

Fig. 4. Gears C and H, through an Idler, are Meshed for Reverse Speed

to neutral and press the accelerator with the left foot. Don't be afraid to race the engine, in this case because time is a vital element and you can't afford to take many chances. The speed of the car is increasing all of the time and if the engine is raced even more than is necessary it only means that the clutch speed is higher than the driven gear speed and this can be remedied later.

Just as soon as the engine has been speeded to its maximum, move the change gear lever toward the intermediate speed position. Just as soon as you feel the teeth of the gears coming together, they may grind a bit, hold the lever there, letting the gears barely rub against each other. Do not force the lever but ease it into place gently. Then, just as gently as possible, let up on the accelerator until you find that the gears cease to grind and the change gear lever may be pushed, quickly, into its place. Not until the lever is fully home should you remove the left foot from the accelerator.

Gears should never be changed without releasing the clutch, except when the car is traveling forward, down grade.

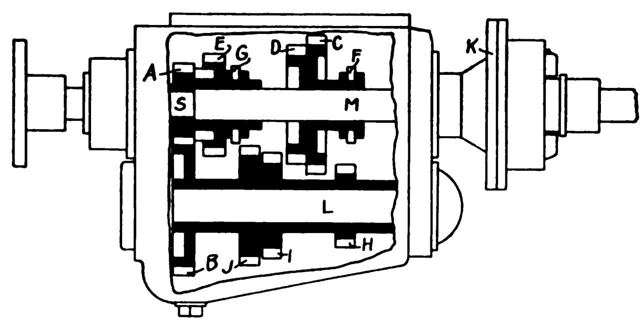

Fig. 5. At High Speed Gear E Fits Into Gear A

I suppose that some of the readers are asking just why the engine should act as a brake under these conditions. All of us are familiar with the old saying that "It's a poor rule that won't work both ways," and so it is with the transmission system. If reduction gearing will decrease the engine speed and increase the power at the wheels, then the opposite is true. If the speed at the

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wheels is passed through a set of gears so that it is increased at the engine, then the speed can be controlled more easily at the engine than at the wheels. The engine is the most effectual brake on your car; it is made to stand heavy duty and is really an air brake.

If you want to prove how strong your engine is, as a brake, drive your car to some steep hill, stop it just at the top of the hill, change gears to low speed and turn off the ignition. It will require an extremely steep grade to roll your car along when the gears are in low and the ignition off.

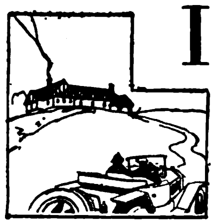
If you know how to use the engine as a brake you need have no fear should the regular brakes refuse to act but if the rear axle should smash on a hill, then the engine and brakes are both inoperative. What can one do in a case such as this? I doubt if there is any really "safe" answer.

Perhaps the reader will, if he finds himself in such a position, do just as I did, steer straight ahead and hope for the best, fearing the worst.

If I had to go through the same experience again I should surely open the door and, as gracefully as possible under the circumstances, step to the ground. The car could do as it pleased. If I saw that there was a high curb at the side of the street I should steer for it and endeavor to slide the wheels against it so that the friction would hold it back. But then, one cannot always be sure what one will do under the stress of excitement; possibly I should do exactly as I did on that day when I drove from Westerly to New London, stick to the ship.

The Bad Boy of the Lubrication Family

By R. H. Kasper



IN DAYS gone by it was quite the thing to hear the folks singing about there being a "little bit of bad in every good little girl." But in the years that have intervened, there is yet to be heard a song about a "little bit of good in every bad little boy." The bad little boy seems to have been neglected; no doubt being accepted as incorrigible. What little good there is in him has been deemed as scarcely worthy of mention.

Good qualities, however, are generally sticking out all over the bad little boy, which, if seen and properly appreciated, usually bring ample reward. It depends upon the treatment whether the bad boy remains a bad egg or becomes somewhat of a plaster saint. And so, with a little pat on the back and a hearty "good luck," the song about the "good in the bad little boy" is about to be sung.

In the "lubrication family," there have always been some members who were viewed with suspicion. Some were too thin, some too heavy, while others burned out and "cracked" too easily. Such cases were simply taken as a matter of course, and were attributed to the fact that these members of the family had not been placed in their proper spheres. But the one member of the family who had never really been given a chance, who had always been regarded as not having one redeeming quality, was the "bad little boy" of the family—graphite.

True, in many case he had acted atrociously, but this was due to the fact that he had been wrongly treated. But, if used rightly, and allowed to associate and mingle with his more favored brethren, he has always proven himself the best of the lot.

Before singing the praises of the bad little boy, it is perhaps advisable to explain why any member of the lubrication family should be needed at all. Every surface, no matter how finely finished, is full of minute irregularities. The shaft which rides in a bearing, the piston which moves in a cylinder, and the gear which meshes with its mate, are all covered with these irregularities.

Two such surfaces, running in contact without lubrication, produces a grinding effect, similar, in a lesser degree, to that which is experienced when two files are rubbed together. Friction reigns supreme, until it is given a knock-out blow by one of the members of the lubrication family. A lubricant fills up these minute irregularities, and forms a more or less frictionless film between the bearing surfaces, preventing actual metallic contact.

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The lubricant used depends upon the load to which the bearing surfaces are subjected; when too light or thin for the work performed, it squeezes out; when too heavy, it offers resistance to the free movement of the parts. Again, there is the danger of burning out or cracking, which makes the choice of the proper lubricant of the utmost importance.

But there is one member of the lubrication family who doesn't care how heavy a burden is laid upon him, nor how hot it is made for him. And that member is the bad boy of the family—the black sheep, whose atrocious behaviour seems never to be forgotten—graphite.

Graphite as a Lubricant

Graphite, as a lubricant for automobiles, has never received the attention and the favor which is due it. Opposition to its use has, no doubt, been due to the impurities contained in many grades on the market. Traces of abrasive material were to be found in many grades—a condition which justified the suspicion with which it was viewed. On the other hand, the difficulty of obtaining graphite so finely divided as to pass freely through the feed holes of the usual oilers aided greatly in retarding its popularity as a lubricant.

When a pure and finely divided brand graphite is used, ill results can be attributed only to ignorance or carelessness in the manner of using. Graphite should be fine enough to practically maintain suspension in oil or grease without undue settling. It should also be fine enough, when used with oil, to flow freely in the oil film without clogging the bearing surfaces.

When graphite first came on the market as an automobile lubricant, ignorance as to its proper use was prevalent. Chauffeurs would purchase a large flake brand, and then generally mix about five times the required amount with the oil. There could be but one result—a clogging up of the lubricating system and a "gumming up" of the works in general. Graphite, willing and anxious to live up to expectations, had been called upon to give satisfaction under such adverse conditions, and failing, was immediately labeled the black sheep of lubricants,—a thing to be avoided.

Results of Research Work

The opposition to graphite as a lubricant led to a series of experiments, which, conducted in an impartial manner, indicated the following results:—

(1) The addition of graphite to oil causes a lower frictional resistance of journals than would be obtained with oil alone.

(2) When graphite is used with oil, the amount of oil required for a given service is reduced. A lighter oil, and even one of inferior quality may be used.

(3) The addition of too much graphite unduly thickens the oil and correspondingly increases the internal friction, due to viscosity.

(4) The lubricating effect of graphite remains long after its application, but the supply should be constant, though small, in order to obtain the best results.

The carriers used in these experiments were the various oils, such as sperm, kerosene, lard, vaseline, etc. To make the experiments exhaustive, even water was used, and sustained a pressure of seventy pounds per square inch in the bearings, when about one third of one per cent, by weight, of graphite was added.

The above experiments left no doubt as to the efficiency of graphite as a lubricant, if used properly. It is practically indestructible, being affected by neither heat, cold nor pressure. Its minute particles permeate the pores of the metal and build up a wonderfully smooth surface layer, in which the carbon particles are intimately associated with the metal. Such a surface is known as a "graphoid' surface, and anyone who has ever seen such a surface cannot but attest to the efficiency of its hard, smooth, mirror-like finish. It stands to reason that any bearing surface which has received a graphited finish will have wear and friction reduced to a minimum.

The ease with which such a surface can be attained is also a great factor in its favor. By adding one fourth of one per cent, by weight, of graphite to the oil, it is possible to carry to all bearing surfaces a material which is finer than the minute pores of the metal, and which will gradually saturate the metal with a lubricant which heat cannot destroy.

Graphite Forms an Ideal Surface

The smooth, hard coating which is gradually attained by the bearing surfaces relieves the oil from some of the service which it must otherwise perform, thereby decreasing the amount of oil required. But its greatest advantage is, that when the oil film is destroyed or shut off, and the bearing surfaces tend to approach each other, the coefficient of friction remains practically unchanged after hours of use.

Many dealers in second hand cars have been quick to see the advantage of using graphite. These dealers must dispense with cars in various stages of disrepair, and some method of "doctoring" must be resorted to, in order to make the car behave satisfactorily during the demonstration. Consider the case of scored cylinders, with the resultant poor compression. The average purchaser knows that a motor with poor compression indicates a car with little power. Something must be done,—a remedy must be applied which is both efficient and inexpensive.

Does the dealer have the cylinders rebored, and new pistons fitted? He does not—he uses graphite, for he knows that the use of graphite offers the possibility of remedying scored cylinders without reboring. Of course, this method is not resorted to by the agencies of the various car manufacturers. These dealers generally rebuild their used cars and sell them at a rebuilt price.

But when a dealer sells cars "as is," the price must necessarily be lower, in order to prove attractive, and the additional cost or reboring would be a detriment. Therefore he resorts to the use of the bad boy graphite—a remedy which gives the same results, which may be

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prolonged indefinitely by the purchaser continuing the remedy.

Everyone knows how tightly snow is compressed into any cracks and crevices by the trampling down to which it is subjected, and what a smooth surface is gradually attained. Graphite produces the same results, but has the added advantage of not thawing out under the influence of heat. The only difficulty encountered is to feed it to the little cracks and crevices. The dealer, however, has an easy way of getting over the difficulty. He starts the engine, and slowly feeds into the air intake of the carburetor, a teaspoonful or so of flake graphite. The engine is left running for a few minutes so that the piston may work the graphite into the cylinder walls, while the excess is driven out through the exhaust. If any of the excess has short-circuited the spark plugs, they are removed and thoroughly cleaned.

When the motor is again started, the lost compression is a thing of the past. The scores have been filled by the little particles of graphite, and may possibly remain filled for several weeks. Of course, this method is not so effective if the scores are very deep, as the compression leakage may be great enough to blow the graphite out of the scores.

Would you call graphite a very bad boy, then because he unwittingly aided in such deceit? But if he can do the work when things are sadly out of repair, why can he not prove efficient when things are running as fine as silk? He can,—and will, if given the chance. And there are many car owners who are giving him his chance, and find him all that is to be desired.

Take into consideration the matter of cylinder lubrication. Graphite has been particularly tabooed for such use, but it is for this purpose that it is particularly to be recommended. Its immunity to the effects of heat, its property of filling the microscopic irregularities in the cylinder walls and ring surfaces, and the durable and almost frictionless coating which it imparts to these surfaces makes it the ideal lubricant.

It may be contended that, as carbon is one of the elements of graphite, excessive carbonization will be the result of its use. Such, however, is not the case; instead, it tends to retard the formation of carbon. The carbon in graphite is not the hard carbon formed by the decomposition of oil, but is of a soft, unctuous nature, capable of imparting a surface to which carbon does not readily adhere. The veneer which is formed on both cylinder walls and piston rings produces a more perfect fit, and permits a more thorough wiping back of the oil.

Less excess oil, therefore, finds its way into the combustion chamber, and the formation of carbon deposits is lessened accordingly. As graphite provides the real lubrication, oil is used mainly as a carrier, and therefore can be used more sparingly.

The only objection which its opponents can still bring forth is that it is a conductor of electricity, and is liable to short-circuit the plugs. When fed dry, there is such a possibility, but the condition is so easily remedied, so why worry? When mixed with oil, the chances are materially lessened. In either case, the superior results obtained by its use more than offset any of the minor disadvantages.

The methods of applying graphite depend upon the lubricating system of the car. For the splash system, a scant teaspoonful is added to each quart of oil in the crankcase, and another teaspoonful at the end of each thousand miles, which may be mixed with the oil and poured down the breather.

For force feed systems, it is better not to mix the graphite with the oil on account of the possibility of clogging some of the smaller passages. Every time a quart or so of fresh oil is added to the engine lubricating system, feed a teaspoonful of graphite to the cylinders, by placing the graphite on a sheet of paper and holding it close to the air intake of the carburetor while the engine is running at high speed.

On account of the location of the magneto on Ford cars, there is the possibility of short circuiting the magneto, when graphite is used in the crankcase or transmission case. Many Ford owners, however, use it with good results.

With the other uses of graphite, many motorists are familiar. Graphite grease for transmissions, differentials, and universals cannot be excelled. It is the ideal lubricant for spring leaves. When used on wheel rims, it prevents rusting and sticking. In fact, wherever lubrication is required, graphite will give good results if used properly, and in the correct proportions.

As more harm can be done by using an excess than by using too little, the user must have faith in the recommendations made for its use. It is a common trait of human nature to disregard instructions. If a teaspoonful of anything is recommended, it is assumed that a cupful is better; when a cupful is recommended, there immediately arises the thought that this is excessive, and only a spoonful is supplied. There can be only one result,—inefficient operation and dissatisfaction for the user.

One of the leading manufacturers of graphite, in speaking of this condition, says: "We are not keen about selling dry graphite to motorists, because most people cannot be trusted to use the small amount we recommend." For this reason, they have placed on the market, prepared lubricants in which the correct percentage of the proper grade of graphite has been blended.

And so ends the song of the bad (?) little boy. Though he is quite a smooth gentleman, he is not as black as he is painted, as he has a clinging disposition and becomes easily attached.

SOME JOB

Lazy Mike—I have a new position with the railroad company.

Weary Rhodes—What ja gona do?

Lazy Mike—You know the fellow that goes alongside the train and taps the axles to see if everything's all right? Well, I help him listen.—The "Lightning Line."

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Silver Soldering Band Saws

If Care Is Taken and Directions Followed a Good Job Will Result

BY DAVID BAXTER

THE wood-working department of any garage or automobile repair shop has to contend with broken band saws now and then. Sometimes there is only one blade, and this always breaks just when it is needed the most. If the mechanic doesn't know how to mend it, it often means a loss of time as well as temper.

The devices and process employed in repairing broken band saws are simple indeed, so that every mechanic need lose but a few minutes to do the mending himself, instead of sending the saw to some other shop; perhaps out of town. If the garage has an oxy-acetylene welding plant in connection with other equipment, the matter is still simple. In fact the welding torch is the logical tool for repairing broken band saws. The process is handier and more easily executed with the welding torch than with ordinary brazing burners because the welding flame is always under absolute control. The narrowest of band saws may be mended without danger of injury to the finest of steel. By using a larger flame the large saws can be handled just as readily.

The old style method of repairing these saws was by brazing with brass filings. The modern method is by what is known as silver soldering. The former is no doubt a good way in its place but the silver solder process is more certain and is a simpler operation. If the operator is at all careful he can make the broken ends of the blade adhere at the first trial.

All that is needed besides a welding torch, or else a brazing torch, is some borax flux, the silver solder, a pair of strong pliers, and a device similar to that shown in the photographs accompanying this text. Ordinary borax powder may be used, or the mechanic may purchase it in the form of patented soldering flux. The silver solder for the purpose of saw mending is manufactured in very thin sheets or strips. It is quite expensive and should not be wasted.

Best Grade Silver Solder Essential

However, only a small piece is required to mend an ordinary saw, so it does not cost much in the long run. It should be purchased from a responsible manufacturer in order to be certain of getting the right metal.

The pliers used in this process must have wide flat jaws and be heavy enough to create considerable pressure.

The other tool needed is a device for holding the broken ends of the saw blades together as shown in Fig. 1. This device is easily made in any machine shop. It may be of either cast iron or steel, with a smooth level surface and overhanging ledges through which is inserted a pair of common set screws. These set screws are for the purpose of holding the saw blade rigidly upon the level surface. A square of the metal between the set screws is removed to permit a free manipulation of the welding flame on both sides of the saw. The lower side of the device is machined so it will rest level upon a work bench.

When repairing a broken blade the first thing to do is to stretch the saw out so there will be no danger of getting a twist in it. Then place the broken ends one on top of the other so that two or three teeth will lap about

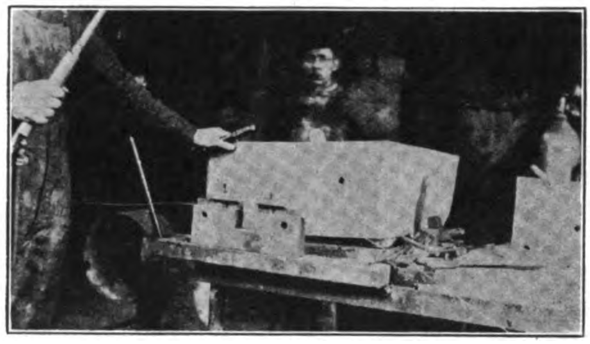

Fig 1. The Band Saw Fastened in the Holding Device

that distance, or rather, so that the ends of the blade will lap about the space of three teeth. These teeth should match one on top of the other exactly. Then mark each blade exactly at the ends of the break. These marks will then be on one side of one blade and the other or opposite side of the other. This marking prevents making a mistake when grinding the broken ends; and also furnishes a guide for the grinding.

After marking, the saw is taken to the emery wheel where each broken end is ground to a thin wedge. That is, each broken end is beveled from the mark to the fracture. This wedge is ground very thin at the broken edge and slopes gradually back to the guide mark. The teeth are also ground with the same slope as the rest of the blade. One broken end is ground on one side and the other on the opposite side, according to the markings.

If the grinding is properly executed the broken ends should fit one over the other without causing a thick place in the saw. The edges of the teeth should match exactly one on top of the other. It is well to fit the wedges together several times during the grinding to insure a good job. The grinding should be done gradually to prevent over-heating the saw metal. The face of the emery wheel ought to be flat and true. A fine grained

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carborundum wheel is probably the best for the purpose.

A good way to make the wedges accurate is to press the broken ends of the saw flat upon the emery wheel with a smooth block of wood. But the pressure should not be too heavy.

When the grinding is correct the next thing to do is to fasten the bevels together in the set screws as shown in Fig. 1, being careful not to get a twist in the saw. First one set screw is loosened and one end of the saw is inserted so that the sharp end of the wedge is somewhere near the center of the large opening. This screw is then turned down to hold the blade firmly in place. The broken end with the ground portion on top should be fastened first.

Then the other end of the saw blade is inserted beneath the other set screw and adjusted so the teeth of both parts fit exactly one over the other. The two ground sides should now be in contact. That is, the grinding should be on the lower side of the upper one and on the upper side of the other. The set screws are then tightened so that they will not slip. The joint is now about half way between the set screws or near the middle of the open space.

When tightening the set screws the mechanic should be very careful to preserve the alignment of the saw blade endwise or lengthwise of the saw. If it is off the least bit at the joint the saw will not travel on the machine but will tend to jump off its wheel. To assist in keeping the blade true it is pushed back firmly against the back of the holding device when the screws are tightened. The teeth side of the blade should be outward leaving the smooth side at the back. The blade should hang

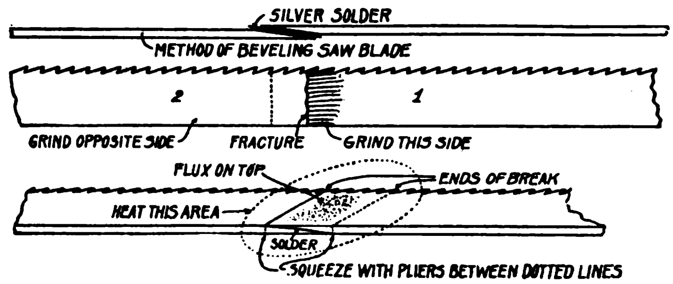
Fig. 2. Heat Both Sides of the Joint Alike

free on each end so it will not get in a cramped position.

Next, the sheet of silver solder is measured on the saw blade to be sure that only enough will be used. As stated above, this material is expensive so there is no use to waste it by cutting more than is actually needed. A piece of the sheet is cut the proper size with a pair of shears or tin snips, being sure that it is wide enough to include the beveled teeth. In other words the piece of silver solder should be cut the length of the beveled portions of the saw blade and as wide, including the teeth. It is not necessary to cut teeth in the solder, however, unless the saw is a large one, as very little of the solder would be saved thereby.

This small piece of solder is now moistened and dipped in the flux powder. With the thumb and finger the borax is rubbed on both sides of the solder. The solder is dipped again in the flux and rubbed to be sure an even coat is spread over the surface of both sides. Then the piece of solder is placed between the beveled ends of the broken saw. This is done by prying them apart with a sharp tool such as a thin screw driver. The screw driver is inserted and turned edgewise a trifle to permit the silver solder to be slipped between the bevels. The screw driver is carefully removed as the piece of solder is worked into place.

This should fit the beveled portion exactly. The me-



Preparing and Soldering the Saw

chanic must be careful not to disturb the alignment of the saw while inserting the silver solder.

A pinch of borax is then placed on top of the joint to further insure a perfect adhesion of the broken parts. This powder melts and creeps into any unfluxed crevice when the solder is melted; the next step in the process.

After looking over the job again to be sure everything is correct the welding torch is lighted and its flame adjusted. It is not essential to regulate the flame to a neutral welding condition but it should be small and have but little blowing fore. That is, the flame should be regulated so it will be mild, or have but little pressure. A small size welding tip and the regulators of the tank screwed down to two or three pounds pressure will produce a flame that is about correct for mending the saw. A large powerful flame is hard to control and therefore hard to concentrate, while a small mild flame may be confined closely to that part of the saw which encloses the silver solder.

When the flame is ready the operator takes the torch in one hand and the pair of pliers in the other because the pliers must be in readiness for instant use before the flame is applied. Then with a wary eye upon the soldered joint the operator applies the flame to the blade. He must watch closely, for the moment the solder melts between the beveled parts of the blade he must squeeze them together with the pliers.

Thus he applies the torch flame to first one side and then the other of the point. Switching from one side to the other in an effort to bring both up to the same stage of heat. When both sides are red hot the solder between them melts. Then the operator swings the flame quickly out of the way and pinches the soldered joint between the jaws of the pliers. Holding the plier jaws flat and level he grips the joint tightly and holds it thus for several moments while the silver solder congeals and

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cools. The grip of the pliers is not relaxed until the operator is certain that the solder is no longer in a molten state; until the saw cools below the melting point of the metal.

To make this doubly sure the saw is allowed to remain in the holding device until fairly cool. Then the set screws are released enough to permit the saw to be slipped out sidewise. If the adhesion is correct the sides of the saw will now be so closely knitted together it is not possible to pull the joint apart. Sometimes it is necessary to clean the teeth and polish the sides of the blade but usually the saw is ready for use the moment it is taken out of the set screws.

A plumbers' common blow torch may be used instead of the welding torch but it takes a little longer and the work is not so neat. The flame is not so accurately controlled but the theory is the same. In fact the theory is the same whatever method is employed to heat the saw. Both ends of the break must be hot enough to melt the solder between and cause it to adhere to all parts of both.

Cleanliness Necessary

The ground portions of each part of the blade not only make the lap the same thickness as the rest of the saw but they furnish a clean bright surface to which the solder will adhere better than to rusty or pitted metal. In fact cleanliness is very essential in the silver soldering process of mending broken band saws.

The sheet of silver solder is very thin but it is best to make some allowance for it when beveling the broken ends of the blade as the soldered joint should be the same thickness as the balance of the saw, blade teeth and all.

The drawings which accompany this text graphically illustrate the extent and location of the grinding. They also show the location of the piece of silver solder, so that the novice should now be able, after a little practice, to mend any of the broken band saw blades in his plant or any of his neighbors if they do not know how to do the work.

Carrying the Band Saw

A soldered band saw blade is an awkward thing to handle or carry around but there are several tricks that eliminate much of this trouble. One of these is to hold the band saw in a large circle straight in front of the body at arms length with on side of the circle in each hand. Then bend forward bringing top half of the circle downward and outward. As the saw descends it will cross and form two concentric loops. When the top of the circle touches the floor the whole saw blade is released and dropped backward. As it falls it will coil into a number of small rings that are convenient for carrying. Thus it may be taken from the metal to the wood-working department without scratched hands.

This silver soldering process may be employed for mending other articles similar to band saw blades, by the application of the same principles. The garage mechanic may find it useful even though he doesn't have many saws to mend.

GETTING THE BEST OF A STUBBORN BOLT

By F. H. Sweet

RECENTLY while working on an automobile it was found difficult to get a bolt started in its place, and when I had about decided to remove other parts to enter the bolt, the following scheme of overcoming the difficulty was tried.

A piece of wire was procured and one end lightly soldered to the bolt head. This served as a handle for placing the bolt and was easily removed by giving the wire a few turns. The same means can be used to enter bolts and pins in places not easily accessible, the time of preparation being small as compared with the practical value of the device. (See Fig. 1-A.) A simple method of starting a nut is shown at Fig. 1-B. The holder is made of sheet metal, rolled into a tube.

A nut is then inserted in one end and the metal hammered to the shape of the nut. Any length of metal can be used, as desired. In use, the shaped end of the metal is slipped over a nut and a slight pressure suffices to screw it down over the bolt. For starting nuts on the end of a bolt in a location not easily reached with a wrench the simple tool shown at Fig. 1-C, will be found valuable.

This is made of steel and has a projecting lip

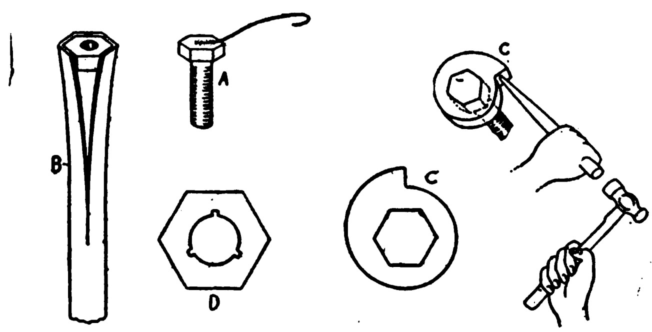

Fig 1

against which a drift may be placed, as shown. The nut may be started by hammer blows without damage. Burred threads on a bolt may be cleaned up by using an extemporized die made from a nut of the proper size, as at Fig. 1-D by cutting a series of three grooves in the threads with a three-cornered file to provide cutting clearance, and then case-hardening the nut interior.

While a stubborn stud or sheared bolt is difficult to remove, one can usually unscrew a nut without much trouble, even if it has become more or less rusted in place. A good method to take off a nut that seems to resist being parted from its stud or bolt more than usual is to heat an open spanner that fits the nut and let it rest against the nut for a few minutes. The heat will soon expand the nut without producing correspond-

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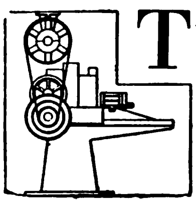
ing expansion of the bolt, and it may be unscrewed. The spanner or end wrench may be heated in a blow lamp flame, and while this idea is very old it is not generally known.

One should not heat a hardened wrench or an adjustable member, as it may be rendered unfit for use. The blow lamp flame should not be applied to the nut direct, because the bolt will be heated and will expand as well as the nut. Kerosene may be poured around the threads with good results, especially if the nut has rusted in place. Several alternate heatings and applications of kerosene oil may be needed before the nut is loosened, and if it still resists, a light tapping with a hammer on all the facets while it is hot may assist in having it become looser on the threads.

Oiling System Faults

The Trouble of the Various Oiling Systems and Their Remedies

By Edward G. Ingram



THERE are three types of oiling systems now in general use—the constant level splash system, the combined force feed and splash system and the full force feed system. In the constant level splash system the oil is drawn from an oil sump by a pump and forced to troughs under each cylinder, where it overflows into the sump again. Spoons or splashers on the ends of the connecting rods dip into the oil in these troughs and splash it to all parts of the engine.

The combined force feed and splash system differs from the constant level splash system mainly in that oil is forced directly to the main crankshaft bearings and in some cases to one or two other points such as the timing gears. The rest of the parts are lubricated by splash. In the full force feed system no oil troughs are provided, the oil being forced directly to both the main and connecting rod bearings, and in some cases to the cam-shaft bearings and other points. In this type the crank-shaft is drilled to conduct the oil to the crank-pin bearings. The excess oil which is thrown from the crank-pin bearings lubricates the cylinders and other parts of the engine.

Many Variations

There are a good many detail variations in the design of the oiling systems used on the various makes of engines. In the case of constant level systems the oil level may or may not be adjustable and there may or may not be a means of regulating the oil pressure. In most force feed systems there is a regulating valve which returns the excess oil to the oil sump. This is, of course, automatic in action, but an adjustment is usually provided for regulating the spring tension on the valve.

In some engines there are two valves under spring tension, one low speed and one high speed, and in others there is a needle valve to regulate the flow of oil to the bearings and a safety valve to relieve the pressure after it has reached a certain point. A few engines have the oil pressure regulated by a valve interconnected with the throttle.

In one type of splash oiling system a plunger pump with a variable stroke controlled by the throttle is used. In another type of splash system movable troughs interconnected with the throttle vary the oil level for different engine speeds. In a few engines a revolving oil distributor is used which delivers a predetermined quantity of oil to each bearing. The timing gears are usually oiled by the engine oil, but in some cases they are housed separately and lubricated by a heavy oil, which is introduced through an opening in the housing provided for the purpose.

Recent Changes

Some of the more recent overhead valve engines have a special lead which conducts oil to the valve rockers on top of the cylinders. In splash oiling systems chambers or gutters are often provided on the sides of the crankcase to conduct the oil to the bearings. Some engines are provided with baffle plates to prevent too much oil from getting to the cylinders. The piston pins are usually lubricated by splash, but in some engines oil is carried to these bearings by tubes running up the connecting rods from the crank-pin bearings.

Gear type oil pumps are used most extensively, though plunger pumps are found on some engines. The pump is usually located either inside or outside the crankcase near the bottom, but sometimes it is placed elsewhere. A screen is nearly always provided at the point where the oil is drawn into the pump. Another screen is usually placed in the crankcase filling pipe.

An oil pressure gauge is usually placed on the dash to show the pressure in the system, and an oil level gauge located on the crankcase to show the quantity of oil in the oil sump. In simple splash system a sight feed gauge is usually provided on the dash instead of a pressure gauge.

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After a car has run from one to two thousand miles the oil in the crankcase should be completely drained out. The crankcase should .then be flushed with kerosene Some makers recommend running the engine for a few moments in order to circulate the kerosene through all of the oil leads to cleanse them. Before putting in fresh lubricating oil, it is important to see that all of the kerosene is drained out as this tends to destroy the lubricating qualities of the oil. In the case of splash oiling systems it is usually necessary to remove the lower part of the crankcase when performing this operation because taking out the drain plug on the bottom of the crankcase will not drain the kerosene out of the troughs. The oil pump screen should be cleaned with a wire brush and, if possible, the oil leads should be blown out with compressed air.

After the parts have been replaced, the crankcase should be filled with cylinder oil to the proper level as indicated by the oil level gauge. The gauge usually consists of a rod on the end of a float, and it is advisable to push down lightly on the end of this rod to make sure the float is not sticking whenever filling or adding oil to the crankcase. When the car is in operation the oil level gauge should be looked at every day to make sure that there is sufficient oil in the sump.

Locating Oiling Troubles

When Gauge Shows Low Pressure

If the oil gauge shows an abnormally low pressure when the engine is in operation, the oil strainer may be clogged, the by-pass valve may be open too much, the pressure release valve may be binding so that it does not close, or the oil pump may be leaking within.

It is a good plan to first throw out the clutch and "race" the engine for a moment, as this may remove a small obstruction in the strainer or oil pipes. If this does not remedy the trouble, the operator should start systematically to examine the various points where trouble may occur. If a gear type pump is found to leak within, the trouble may usually be remedied by reducing the thickness of the pump housing by rubbing it on emery cloth. The thickness of the housing should be reduced to a point where the pump can just be turned freely with a screwdriver.

If the oil gauge shows no pressure when the engine is "raced," the oil pump shaft key may be sheared off, the pump may need priming if it is of the gear type and lo- occur. If a gear type pump is found to leak within, the bad stoppage in the oil strainer or feed tubes or one of the tubes may be broken. The trouble must, of course, be remedied by locating and removing the cause.

Indication of Failure

In constant level splash systems in which a sight feed gauge is provided on the dash to show the flow of oil, failure of the oiling system is usually indicated by a diminution or cessation in the flow of oil through the gauge. The burning out or overheating of one of the main bearings of an engine with a simple splash oiling system may be due to the oil collecting wells that direct the lubricant to the bearings becoming filled with dirt or gummed oil. Where an adjustment is provided to vary the oil level, over or under lubrication may be due to an improper adjustment of the overflow pipe.

There are a few cars which have oiling systems differing materially from the usual types. One of these is the Ford. In the Ford engine the flywheel dips into the oil contained in the bottom of the flywheel housing. When the engine is running the flywheel picks up oil and, due to centrifugal force, throws it into a pipe which conducts it to the front of the crankcase. There are troughs under each cylinder and the oil flows back from one trough to another until it eventually finds its way into the flywheel housing again. The connecting rods dip into the oil in the troughs and throw it to all parts of the engine.

There are two cocks on the lower part of the flywheel housing to show the oil level. The crankcase should be filled until the oil runs out of the upper cock. The oil level should never be allowed to fall below the lower cock. If the engine shows signs of insufficient lubrication then the oil pipe for conducting oil to the front of the crankcase may be clogged up. As there is no sight feed oil gauge on the Ford engine, there is no warning of such a stoppage until the engine starts to overheat or show other signs of insufficient lubrication.

A few of the older of engines are equipped with what are usually termed "mechanical oilers." In this system a number of individual pumps located in a unit on the dash draw fresh oil from a tank and deliver it through leads to the various parts of the engine. There are separate adjustments to regulate the quantity of oil delivered through each lead and separate sight feeds are provided for each lead. Mechanical oilers are usually driven by a belt running from a wheel on the end of the camshaft. Insufficient lubrication may be due to a slipping belt.

Insufficient Lubrication

In general it may be said that insufficient lubrication is usually indicated by overheating and noisy operation, and over lubrication by a smoky exhaust and fouling of the spark plugs. If the cooling system is working properly the spark is correctly timed, the carburetor is properly adjusted, there is sufficient oil in the crankcase, and the engine continues to overheat, the indications are that the trouble lies in the oiling system.

While a smoky exhaust usually indicates over lubrication, it is possible the trouble may be due to worn piston rings or cylinders which allow too much oil to pass up into the combustion chamber. The trouble can usually be remedied by putting in new rings or reboring the cylinders.

TOO TRUE

"So you graduated from a barber college? What is your college yell?"

"Cut his lip, cut his jaw, leave his face raw, raw, raw!" —The "Lightning Line."

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Cold Chisels and Hammers

BY J. F. SPRINGER

THE *cold chisel* is a very useful tool when made right and used right. Octagonal bar steel, containing 0.65 to 0.85 carbon, is suitable if of proper quality. The "diameter" may be 7/8 or 3/4 inches. A piece 6½ or 6¾ inches long should, when forged to shape for ordinary miscellaneous use, furnish a tool 8 inches from cutting edge to head. It may seem best to form the business end of the chisel while the shank is still a part of the bar stock. It is a question of simple convenience.

One selects two opposite faces of the octagon and forms the chisel so that these shall be the right and left side faces of the finished chisel. The end of the piece of bar is then forged on the anvil with the aid of a hammer. The two faces are made to slan[illegible]v towards each other. A ring may be marked round the end just before forging begins. It indicates the point at which the faces begin to converge towards each other. If it is taken about 1½ inches from the end, the business end of the finished chisel will then be just about double this—that is, 3 inches—in length. However, this estimate is based upon the assumption that the business end is to be no wider than the shank.

If the chisel, in being beaten to form, is to be made wider at this end, then more metal will be required and one will need to begin further back than 1½ inches in order to get it.

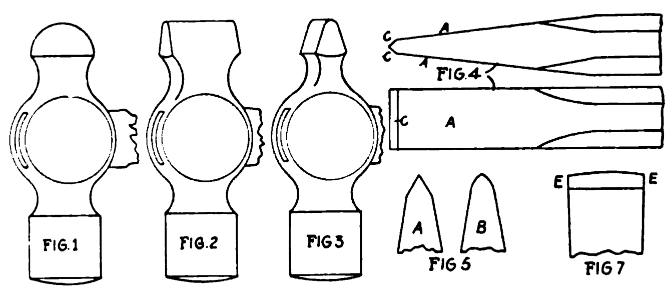

Fig. 1. Ball Pene Hammer; Fig. 2. Straight Pene; Fig. 3. Cross Pene; Fig. 4. Flat Surfacing Chisel; Fig. 5. (A), Correct Form for Chisel; (B) Incorrect Form; Fig. 7. Chisel for Smooth Chipping

When the tip is, say, 3/16 inch thick, it will be about right for ordinary shop purposes. Let the sides and faces be examined now to see whether they are right. The tip should be straight across. The cutting edge may next be formed. This may advantageously be done on the grinding wheel. We will suppose that the tool is to be used as a *flat surfacing chisel.* This is a matter about which it will be well to be particular. The cutting edge will naturally be of a V-shape. For use with such soft metals as copper, babbitt metal and lead, the V may have an angle of 25 or 30 degrees. This is fairly sharp, and so is unsuited to hard metals. If the chisel is to be used on brass or cast iron, the angle may properly be made blunter—say, from 40 to 55 degrees.

For still more difficult work, as steel, the angle may be flattened to 60 or 70 degrees. When the chisel is in use, one side of the V will be flat against the work, or nearly so. It will be readily seen, perhaps, that the sharper the V, the greater the action of the chisel. One accordingly makes the chisel as sharp as the nature of the metal in the work permits.

It is particularly to be noted that the surfaces produced by grinding should be absolutely flat. They should not be rounded either in a cross-section of the chisel at the point nor in a longitudinal section. The flat surface is, in fact, to be on another flat surface when in action. This flat surface of the work serves to guide the chisel in its advance, and this affords a strong reason for making the sides of the V cutting edge absolutely flat.

If Grinding Is Properly Done

When the grinding is done properly, the extreme cutting edge will, with the axis of the chisel, determine a plane parallel to the top and bottom faces of the octagonal exterior of the shank. This plane should also be half way between these same faces.

A slight change in the grinding will produce a cutting edge suited to *smoth chipping.* The extreme cutting edge is left as it was before, except that it is slightly rounded. This may be understood better, perhaps, if one says that when the finished chisel is stood vertical, on a plane surface with its edge down, this edge will touch the plane surface at only one place—that is, at the center of the edge line.

It will at times be well to forge the cutting end wider than the body of the chisel. If the metal to be cut by the chisel is hard, this excess may run from nothing at all to 1/32 or 1/16 inch. The side faces are to be kept parallel to each other and to the side faces of the octagonal shank. If the metal to be cut is soft, the widening of the cutting end may be enough to bring the width to 1⅛ inches or even a little more.

In some work, as in the cutting of the faces of a mortise, a variation in form may seem desirable, in order that the axis of the chisel may be kept nearly parallel to the surface being cut over. In the chisel form already shown a longitudinal section parallel to the sides of the octagonal shank surface will show a big narrow V with a smaller and flatter V at its tip. Both V's will be isosceles—that is the sides will be equal.

In the case of the mortising chisel, now in hand, a similar longitudinal section will show V's entirely different. One side of the big V will be a prolongation of a side face of the body of the chisel. If the chisel is stood up vertical, this side of the big V will also be vertical. The other side of the V, however, will be less steeply inclined than before. The little V is made somewhat simi-

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lar. The one side—next the vertical side of the big V—is almost vertical but not quite. The other side of the little V is given a fairly gentle angle in the longitudinal—say 60 degrees.

Naturally, the angle of the little V, just as before, will be varied to suit the metal to be cut, a sharp angle being used for a soft metal like copper or lead, and a blunter angle for a harder metal.

A cold chisel, intended to cut a groove with parallel faces and right angles at the base, may be formed as follows: The end devoted to the cutting is to be forged wider than the shank. But the faces formed are now to be made approximately parallel. The cutting edge itself is to be perfectly straight across and is to have angles at the sides that are approximately right angles. The cutting edge will have exactly a length that is equal to the width of the groove to be cut. But above this edge, the broad flat surfaces are to be made to approach each other slightly.

The idea is to give a slight amount of opportunity to lean the chisel to the right or left as it is made to cut its way along and form the groove. A vertical section along the direction of advance will show a large V tipped by a small V.

Some Special Cold Chisels—The Hammer

The grooving chisel which makes a narrow trench-like groove may be modified in accordance with the accompanying drawing. (I am indebted to W. H. Van Dervoort for the illustrations of chisels and also of hammers shown in this article.) The bottom face may be plane or curved. The tool with the plane bottom is suited to the cutting of grooves for straight oil ways in loose pulleys and shaft bearings. Where the groove is to be spiral, the curved-bottom form is the thing.

The next illustration shows a tool having a diamond point. It is suited to the cutting of angles, this tool being used along the line of intersection where one face of the angle meets the other face.

The Chisel Head

This is the end where the hammer strikes, and may be advantageously reduced in area below that of the cross-section of the body. Thus, the head end may be given a slight conical taper for ½ or 1 inch. When the head is finished thus, there is less danger, it seems, of forming a troublesome, bushy end.

In handling the chisel, one seeks to become expert at hitting the head with the hammer without looking at it. The attention is to be directed to the cutting edge. Light, indecisive blows are not to be given just prior to each real and decided blow.

The style of hammer suited to use with the cold chisel is the form known as the *machinists' hammer.* The illustrations show representative styles. The hammer, exclusive of the handle, will weigh anywhere from 12 to 14 ounces, avoirdupois. It should be made of fine quality steel and this metal should contain sufficient carbon to enable the head and pene to be hardened. The head may suitably be given a cylindrical form, like the forms in the illustrations. The striking surface may be given a slight convexity. The pene may have a ball face or a flat one or even a form like a very blunt chisel. This last is the cross pene. The head proper is used in cold chisel work; the pene is used in riveting.

Heat Treatment of Chisel and Hammer

The choice of steel for the cold chisel may very well be allowed to rest on *crucible steel* having a carbon content of 0.90 to 1.10 per cent. This is a tool steel and is suited for chisels that will have to deal with iron or steel. A lower carbon content is permissible though. For machinists' hammers, crucible steel having a carbon percentage in the range 0.85-1.15 is suitable. A good average steel is one containing 1.00 per cent carbon. All these steels are weldable without much trouble. The forging may be done at about 1600° F. (*bright red* or *salmon*). This is perhaps lower than the temperature the reader would naturally use.

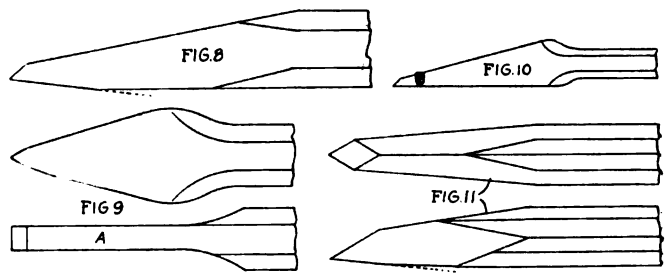

Fig. 8. Mortising Chisel; Fig. 9. Grooving Chisel; Fig. 10. Modified Grooving Chisel; Fig. 11. Diamond-Pointed Chisel

While a good deal of the deterioration of steel brought about by forging and other operations carried out at high temperatures can be afterwards remedied, it seems better not to take too much of a chance. Heating steel above a medium cherry red (1274° F.) has the effect generally of injuring the quality by enlarging the grain size. The higher the temperature the bigger the grains and the weaker the steel.

This, in a nut shell, is the usual theory, and should be followed by all means. The moderate temperature given for the forging heat will perhaps be a little harder on the muscles; but that is part of the game. In forging, let the hammer strokes be active until the color drops to the medium cherry red. Then let it stop.

After the forging is completed, the work is to be allowed to cool for a time after the disappearance of all color. It may, if desired, be allowed to cool off completely. The real point is to get the hammer or the chisel well below 1274°, inside and outside. Then the work is to be heated up again until it is hotter than 1274°, whether one thinks of the interior or the exterior. If the heat can be carried somewhat above the medium cherry red until it verges on to a full cherry red, and then can be held there until it is certain that the inside is also at this heat or very close to it, it will be well.

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A simpler rule will be to heat to a full cherry red outside. The object of this treatment is to bring the grains back as far as possible to their smallest size.

Hardening

The work may be hardened by dipping at this same temperature; so that it will not be necessary to heat up again for this treatment. The hardening is done by immersing in plain water, brine or oil. The difference between these quenching liquids is roughly this: The salty water will chill the steel most quickly of all and produce the highest degree of hardness. Water comes next, and oil last.

The requirements for the chisel may be stated thus. A stiff shank is desired in order to avoid the nuisance of a bent shank and in order to avoid too severe effects on the head from the hammering when in service. Then the finished chisel should be quite hard at the cutting end. This hardness is to be extended back into the region of the shank. A plan recommended by Mr. D. K. Bullens for the purpose of producing a stiff shank consists in heating up the blank as if for hardening and then immersing the whole in an oil bath. This is done prior to any forging. If there is no oil available, at the time, then the bath may be of hot water. The water may be heated by putting in pieces of hot metal.

"The problem of producing a good chipping chisel is simple, and yet has met with more difficulties than the majority of other such tools." The dipping of the chisel, whether to harden the cutting end or to immerse the whole blank before forging, is to be done vertically. That is, by means of tongs or a wire or otherwise, the chisel is held with its length up and down, and in this manner dipped or immersed. When hardening the cutting end, the chisel is to be dipped quickly in and moved up and down for, say, an inch. This bath is continued until the cutting end is fairly cool. The object in moving the work up and down is partly to stir the water and bring cool water to the work and partly to avoid having a sudden change from the very hard cutting edge and the not-so-hard shank. If this sudden change is permitted to impress itself upon the chisel, one may find later on that a break is apt to occur at this point of sudden change.

For Hammers

The foregoing directions as to forging and hardening are, in the main, suitable for hammers; only, the hammer face and the pene are desired hard and the eye soft. The two parts that are to be hard may be hardened separately. The work is held vertical and is moved up and down a short space to avoid a sudden change from hard to soft.

Tempering

This is a very particular part of the work, as just the right degree of hardness is desired at the finish. Tempering has for its object the elimination of strains and stresses introduced by the abruptness of the hardening action. Naturally, it takes away a little of the hardness. The surfaces where the hardening has been done should be bright and clear, so that there will be no trouble in noting the temper colors as they come and go.

Tempering may be done in the case of the cold chisel by means of the heat left in the shank at the end of the hardening operation, if one is careful to manage things just right. And perhaps this is a better way than heating the chisel by means of a hot slab on which it is laid for the purpose. If the shank has lost too much heat, one may still use the preferred method, as all he has to do is to heat the shank portion again. However, this heating of the shank is to be done carefully and by the use of low temperatures. Otherwise, too much heat may be obtained. A *peacock color* (between brown and purple) is a proper color for which to watch. When this color appears at and near the edge, the chisel is to be dipped into water, in a vertical position with the cutting edge down.

The Hammer Temper

E. F. Lake gives a *faint straw* as the proper color for hammer faces. It will hardly be practicable to use the hardening heat left in the center as a means of tempering for both the hammer face and the pene.

A "BLIND CONSTRUCTION" DIFFICULTY

BY DONALD A. HAMPSON

IN MECHANICAL work, there sometimes crop up what are known as "blind constructions"—meaning constructions which lock themselves together on assembling and cannot be taken apart except by actually cutting some of the parts. An example of this in automobile construction appeared in one model of the Pullman a few years ago. The cam shaft was carried in a separable casting that could be removed in a few minutes for work upon it or other parts of the engine.

Cams and shaft were integral and one end of the shaft carried the driving gear whose outer side was encased by a pocket of the casting. Four babbitt bearings were provided—these being poured into undercut recesses in the casting. The construction was cheap, neat, and efficient *until* one had to renew a bearing or the gear. The shaft could not be removed without cutting out all the bearings and the same was true of the gear! Easy enough to get the parts out, but how to renew the bearings or scrape them after they were poured or to line up the shaft were puzzlers. If the bearings had been split instead of solid, there would have been no hitch.

The writer renewed a number of these jobs after the owners had broken the gear teeth. The method of lining up the shaft and providing dams for the babbitt need not be detailed. Before setting in place, the journals of the shaft were given a thick coat of red lead—thicker than would be used for scraping in a bearing. Pieces of one-

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quarter inch round steel were set against the shaft and propped at the correct angle; these were pulled out after pouring and formed the oil holes to the bearings—which could not well have been drilled because the shaft was hardened.

The coating of red lead provided enough space between shaft and babbitt to give us a running fit after the babbitt was hardened and cooled. This method turned out the job in reasonably short time but the opportunity to view the job from the repair standpoint goes to emphasize how much a buyer takes for granted and how a slip in design may create an unfavorable impression years later.

A B C of the Automobile

Working of the Transmission and Operation of Cone Clutch

By Robert A. Chandler, S. A. E.

BEFORE considering the clutch we shall run over the parts of the transmission in detail. Used in an engineering sense the word "transmission" means the part or parts by which the power is delivered from the source to the work. Thus we have rope transmission, shafting with belting and pulleys, gearing, and so on. Applied in this sense to the automobile the transmission comprises the following set of parts: clutch, gear-set, one or two universal joints, drive shaft, and differential, which delivers the power to the axles and wheels. The work of the wheels consists in pushing the ground out from under them, thus propelling the car. We shall study these parts in the order named above.

The purpose of the clutch is to connect and disconnect the engine and the rest of the transmission. It must connect them in order to drive the car, and it must enable the driver to disconnect them so as to shift gears readily, as gears should never be changed when under load. The clutch also enables us to stop the car without shifting gears or to allow the car to coast, *i.e.*, to run on momentum on a level or to run down hill. We leave the gears in mesh with the clutch out and control the speed by means of the foot brake. But the requirements of a good clutch are more than a matter of taking hold and letting go. When it takes holds it must do so gradually. Let us see how this works out.

The Problem

The car is standing with the engine running. In order to start you press on the clutch pedal, which throws out or disengages the clutch. You shift the gears into low speed. You now let in the clutch gradually, bringing the foot back to do so. At the same time you give the engine more gas by means of the accelerator pedal or the throttle lever on the steering wheel. This is to give the engine power enough to start the car. But the car must start gently, without shock. If it starts with a jump there is danger of breaking the universal joints, the drive shaft, the gears in the differential, or the rear axles, besides making it unpleasant for the passengers.

In order to take hold gradually the clutch must slip. The fly wheel is moving rapidly and the clutch is at rest. As the clutch engages with the fly-wheel it must not do so immediately but must hang back. This means that the fly wheel slides over the face of the clutch, which gradually takes hold, slipping less and less until it holds without slipping. While doing this it must increase its speed smoothly and evenly, without jerking. This, you will see, is a difficult problem.

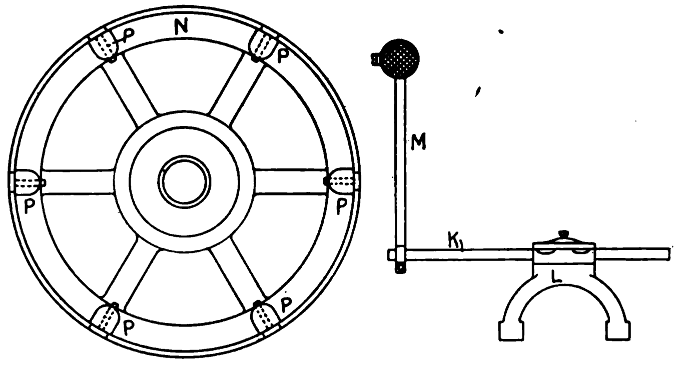

Fig. 1. Cone Clutch Units. L, Clutch Throw-Out Collar; M and K, Throw-Out Pedal and Shaft; N, Clutch Cone; P, Compensating Plungers

It is easy to provide two surfaces which will slip. It is easy to fasten two parts so that they will hold. But it is little short of an engineering triumph to design a device which will slip at one time and hold at another, that will slip at starting, will take hold gradually, and then will hold without slipping. Let us see how this is achieved in the cone clutch.

In the first place the angle of the cone must be 11 degrees. If the angle is too sharp the clutch will wedge itself in too suddenly. If the angle is too blunt the clutch will slip too long and, unless the spring is very strong, will not take hold at all. Having settled the angle of the clutch face the next problem is the friction surface. Sole leather was the only material used in the beginning, but later on brake lining was found to be satisfactory. But if the leather dies out it loses its ability to take

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hold gradually and so must be treated with neatsfoot oil from time to time.

Clutch Troubles

Cone clutch troubles are few in number, the one just mentioned being the most frequent. This is called a gripping, grabbing, or a fierce clutch. It starts the car with a jerk, no matter how carefully it is engaged. It is due to the leather drying out and so slipping longer than it should and then engaging suddenly. The remedy for this is neatsfoot oil or castor oil, the first being preferable as it is thinner and soaks into the leather more readily. A certain amount of skill is required to apply the oil properly, however.

The clutch is inside the flywheel and it only comes out a quarter of an inch or so when disengaged. One way is to hold a piece of thin metal or a card against the leather and to pour the oil on this. By this method the oil is guided in on top of the leather. Another method is to use an ordinary squirt can, such as used for oiling. In fact an extra can, empty, should be carried on the car for just such emergencies, using kerosene or gasoline for cleaning, etc.

Place a little oil on the leather and then let the clutch in to spread it. Disengage again and turn the clutch a few inches and put in more oil, spreading it in the same way. After the surface has received a liberal coating the clutch should be blocked out over night, which can readily be done by means of the jack, blocked up against

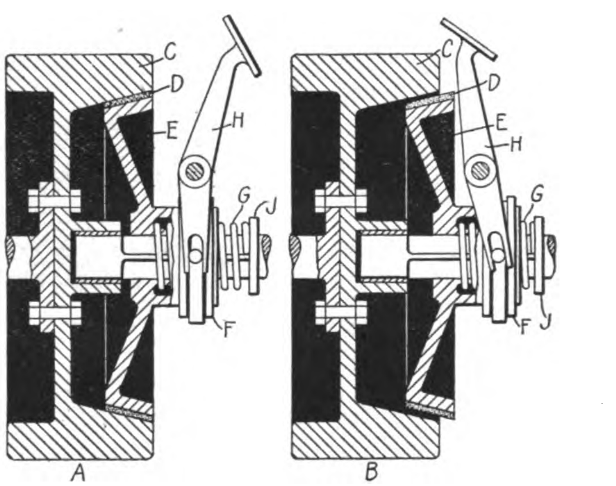

Fig. 2. Cone Clutch is "In" at A and "Out" at B. C, Flywheel; D, Leather Facing; E, Cone; F, Throw-out Collar; G, Spring; H, Pedal; J, Retaining Collar

the front of the seat. This is to prevent the oil from being squeezed out by the pressure from the clutch spring.

Slipping clutch: the engine runs faster than usual and the car more slowly. In extreme cases the car does not move. This trouble may be due to a worn lining, to oil or grease on the lining, or to a weak or broken spring.

In the first case the lining is worn down until the rivets touch the fly-wheel and slide instead of holding. Of course the proper remedy is to re-line the clutch but this is expensive and it may not be convenient to do so just then. A temporary remedy is to raise the lining by means of thin pieces of metal—pieces of hack-saw blades are good but other thin metal will do. Crowd in as many as you can, side by side, but not one on top of the other. This should enable one to use the clutch for several weeks longer or until some convenient time for overhauling.

Oil works back from the crank-case and grease works forward from the gear-set. The best way to remove this condition is by the use of Fullers' earth. This is a very absorbent powder which takes up the grease or oil and falls out with it. What remains has a slight grain or grittiness which helps the clutch to hold. It may be thought that gasoline would be the best thing with which to dissolve oil or grease and this would be true if the clutch were out and the leather could be soaked in gasoline. But in its place in the fly-wheel the leather is not so readily reached by the gasoline which simply runs off, taking very little oil with it. Fuller's earth is the best treatment.

A weak spring or springs may be tightened by the adjustment provided: a broken spring must be replaced. If the clutch has three springs and one of them breaks, it will not work properly on account of the uneven pressure. A washer may be slipped between the parts of the spring, which will prevent them from sliding by each other.

Spinning Clutch

Spinning clutch: this may be due to a worn clutch brake or to the center bearing running dry. A clutch brake of some kind is necessary with a cone clutch on account of its weight. When engaged, with the engine running, it has the same speed as the fly-wheel. If it is then disengaged it has a fly-wheel effect of its own which keeps it spinning, making it difficult to mesh the gears.

A friction device of some kind is always provided which slows down the movement or brings the clutch to a full stop. The brake comes into play simply by pressing the clutch pedal as far as it will go. But if the lining is worn the clutch will continue to spin and the gears will growl. Another cause is neglect of the center bearing of the clutch, where it is supported on the end of the crank shaft, extending through the fly-wheel. As this bearing dries out the friction tends to keep the clutch moving. The remedy, of course, is proper lubrication.

Seized clutch: this is an aggravated case of neglected bearing. If let go too long the center bearing of the clutch will seize to the end of the crank shaft and refuse to separate. The clutch always spins, even when the pedal is pressed all the way, and the gears cannot be meshed without grinding. In order to shift gears we force the lever until they mesh. They protest, growling fiercely, but they finally mesh and the car jumps forward in the new speed. This is ruinous to the gears and the clutch bearing should be repaired as soon as possible. This means removing the clutch and fitting a new bushing—an expensive process. The moral of this is not to neglect the clutch bearing.

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Care of the Clutch

The care of the leather covered cone clutch may be gathered from what has gone before. Specifically we may mention the following details:

(1) Lubricate: not only the main bearing but all the moving parts such as the shifting yoke, clutch pedal, etc. The kind of lubricant depends upon whether they are fitted with grease or oil cups.

(2) Engage the clutch gently. This is not only to prevent ripping the lining off the clutch face but also to protect the rest of the transmission. A sudden strain may break the universal joint, the small gears in the differential, or the drive shaft or rear axles: if on slippery ground the rear wheels may spin, wearing the treads.

(3) Apply neatsfoot or castor oil to the leather at least once a month.

(4) If the clutch has a tendency to slip, investigate the cause and apply the remedy, as explained above.

(5) Prevent unnecessary slipping. This is a vicious practice, known as "slipping the clutch," which is resorted to in order to give a speed a little lower than the one in use. The high speed may be a little too fast and you wish to slow down slightly. If you throttle down too far the engine will stall. Throwing out the clutch and coasting and then letting it in again makes an irregular movement. Most drivers seem to have a dread of slipping back into second gear, which is the proper thing to do in the circumstances. So they slip the clutch, pressing on the pedal just enough to allow the clutch to slip but still drive the car. This gives a speed intermediate between the second and the high, without the trouble of shifting gears, and the high speed is resumed by simply removing the foot from the pedal. This practice is usually done in city driving when approaching a block in the traffic.

But one is often tempted to do it when driving up hill

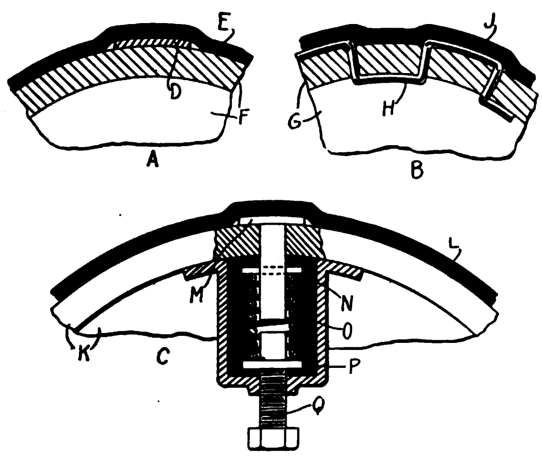


Fig. 3. A, Shows above, Inserted Leather or Wood to Prevent "Grabbing." B, Woven Wire for Same Trouble. Below, Details of Compensating Plunger. C, Clutch Cone; D, Leather Insert; E, Facing; F, & G, Cone; H, Wire Insert; J, Facing; K, Cone; M, Plunger; N, Retaining Pin; O, Spring; P, Limit Shoulder; Q, Adjusting Screw

on high. The summit is almost reached but the engine is in danger of stalling. Instead of shifting into second the driver presses on the pedal and so reaches the top without shifting gears. People seem to forget that the second speed is put there for just such emergencies and so prefer to "take it out" of the clutch. Needless to say such practice is ruinous to the clutch leather. The friction wears it away and dries it out, making it grip suddenly when applied and shortening its life materially.

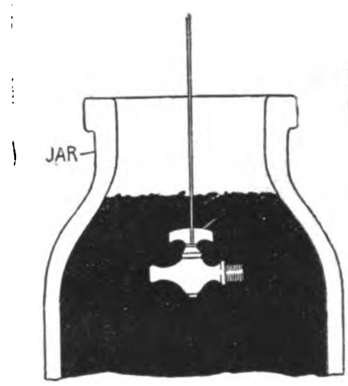
(6) Keep the foot off the clutch pedal. A few drivers have the bad habit of resting the foot on the pedal so as to have it ready to use. It is almost impossible to do this without slipping the clutch. The result is almost continuous wear on the clutch surface. As the effect of a slipping clutch is to decrease the speed of the car, they open the throttle slightly more and so waste gasoline. From both sides, then, this practice is to be condemned. Keep the left foot near the clutch pedal but not touching it. Experienced drivers do not have to feel for the pedal; the foot finds it instantly when wanted. If you try you can do the same.

CLEANING SMALL BRASS PARTS

By R. L. Prindle

Small brass parts, including pet cocks, carburetor parts, etc., are readily cleaned by immersing in the follow-

Method of Cleaning Brass Parts



ing solution: nitric acid, 75 parts; sulphuric acid, 100 parts; lampblack, 2 parts, and salt, one part. This solution is mixed thoroughly and kept in a glass jar, and the parts being cleaned are made new in appearance, and should be carefully rinsed afterward.

SUFFICIENCY

Walker: "Have an accident?"
Rider: "No, thanks, just had one."—*Puppet.*

CHANGING THE CALL

"They say Edison is working on a machine that will enable us to talk with the departed."

"I suppose the proper call will be Heaven-ho! instead of Hell-o!"—*Boston Transcript.*

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Car Equipment and Contributory Negligence

ALTHOUGH no one can say just what a jury will decide or what a judge will rule, because of conditions, few of us care to be in a position to make a test of the law to form a precedent. The large majority of us, who drive cars, wish to obey the law and though our intent may be of the best, few of us can say that we know the law. In fact there can be no absolute law which will fit all cases; only the interpretation of the law by the judge or the law as established by precedent can be used as a foundation.

There is one phase of the law which all of us should know about and which is the subject of this Editorial—the matter of contributory negligence. The automobile owner is responsible for his machine and its equipment.

For a number of years, in some parts of this country, the automobile was considered by our law makers to be a "dangerous mechanism." It was put in the same class as a load of dynamite or a wild elephant. Only after much experience was it found that the machine was not in itself "dangerous" and that the danger to the general public was only dependent upon the driver and the mechanical condition of the car.

As matters stand to-day, it is evident that the courts throughout the country are tending toward making the car owner responsible for his machine while it is being driven on the public roads. This is a tremendous responsibility for the owner and he should realize it.

The owner is guilty, usually, of contributory negligence if his chauffeur, while acting under his orders, causes an accident of any kind. If the chauffeur is intoxicated, it is held that the car owner is responsible. The owner should not hire or keep employed a chauffeur whom he cannot trust.

The owner is responsible for the mechanical condition of his car. If the brakes refuse to work and it can be shown that the mechanism has been at fault and the condition known by the owner, then the owner can be held for any accident resulting.

Every owner should see to it that his car has suitable equipment in the way of signals, brakes, lights and so on, for if any accident should happen, these things, if wrong, may cause his downfall.

Is a State Automobile Limitation Law Constitutional?

A LARGE NUMBER of our states have enacted reciprocal license laws in regard to automobiles. In such cases an owner may drive his machine into neighboring states without obtaining a special license to do so, provided he has complied with the laws of his own state. But there are still a number of states which limit the visit and claim that an automobile driven on their roads is a violation of the law, if the time limit is exceeded. But is such a limitation law constitutional?

Just why should a citizen of the United States be restricted to sojourn in the town or city where he resides? If it is constitutional to limit the vist of automobiles, why is it not just as reasonable to restrict watches, clothing, shoes or even the man himself?

If it is constitutional for a state to limit the time of a visit, why is it not just as constitutional for towns or even villages to enact such legislation and thereby raise considerable revenue in fines upon the unsuspecting autoist?

We, who are native born citizens and who abide by the laws, like to feel that we are living in a free country. We like to feel that we can travel all over this fair country of ours without the danger of breaking some state law and yet here is a law which limits us, which prevents us from taking our personal property into certain parts of the country.

As we understand it, our Constitution is framed to allow every resident of this country equal rights. So long as one obeys the laws of justice and does not interfere with the rights of others, one is free to do as one pleases, to say what one chooses and to be a slave to no one.

Article 14, section 1, states: "All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States, and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States . . . nor deny to any person within its jurisdiction the equal protection of the laws."

Could anything be more clear than this? If New Jersey, for instance, which has an automobile limitation law, chooses to arrest a New York citizen because that citizen is driving a car with a New York number plate, is not New Jersey "enforcing a law which abridges the privileges of a United States citizen"? We claim that she is and that it is high time that the Federal Government took steps to make this country free for automobilists.

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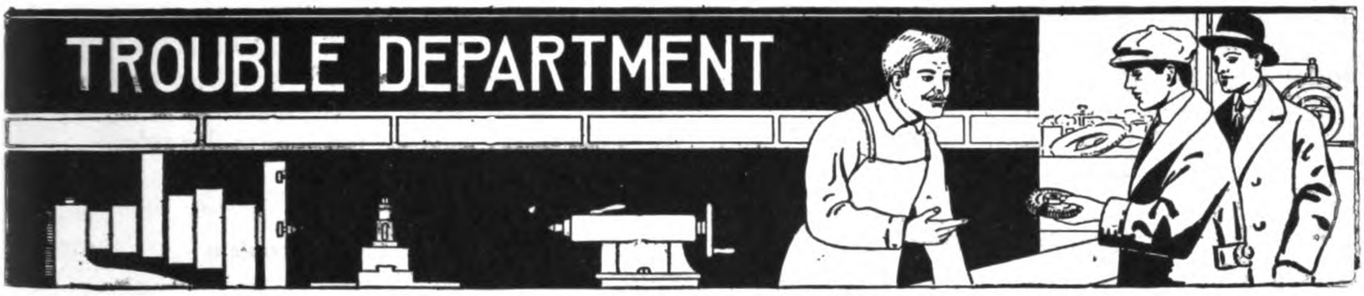


A Further Answer to Mr. Marbach

2991

From R. K. Cobban, Oregon: In the February issue of the magazine there was a question entitled, "Battery with a High Tension Magneto," from W. J. Marbach, of Texas, and I feel that your reply to this query falls short of giving Mr. Marbach a real cure for his troubles in starting heavy tractor motors.

Enlarging upon your caution, that there is certain damage done to the magnets of the magneto each time the dry cell batteries are used, there is a great chance that the magnets would eventually lose all magnetism if batteries were used at all. There is always a chance of the operator failing to switch over to magneto after the motor starts and with inexperienced operators there is the chance of them switching to battery ignition as soon as the motor shows signs of bucking, generally due to some other cause outside of ignition.

Most all if not all, of the K. W. and Bosch Magnetos now put out for tractor service are equipped with impulse starters, and where motor and magneto are properly timed there is very little call for spinning the motor in starting, the impulse starter catching and holding the magneto until the piston is about to pass top dead center, when the catch releases, spinning the magneto to produce a good hot spark. Usually two or three quarter turns of the crank does the trick.

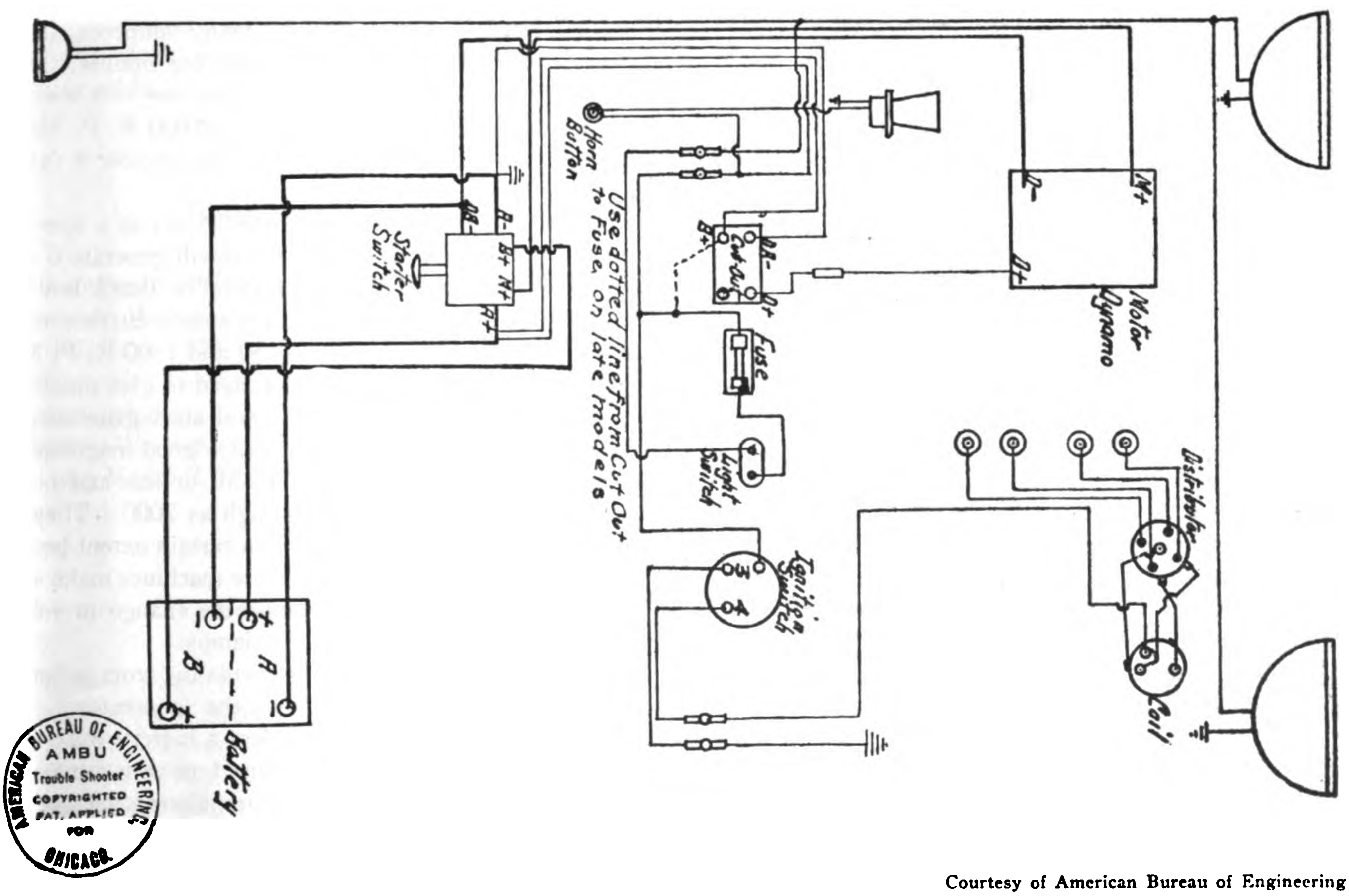
If Mr. Marbach's tractors are not equipped with impulse starters, I think he can get the attachments and use his old magnetos successfully. But if he already has impulse starters either the breaker points are in poor condition, or the magnets of the magnetos need to be magnetized.

Wiring of Dort, 1915

2992

From J. B. Lofstrom, Minnesota: Will you kindly publish the wiring diagram of the Dort, 1915, car

SPLITDORF-APELCO Dort 1915



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equipped with 6-12 volt battery, the Splitdorf-Apelco system?

Reply: On page 45 we print the wiring diagram which you request.

Wiring of 1915, Saxon

2993

From Wm. Schroeder, Illinois: Will you kindly publish the wiring diagram of the Saxon 1915 "Four"?

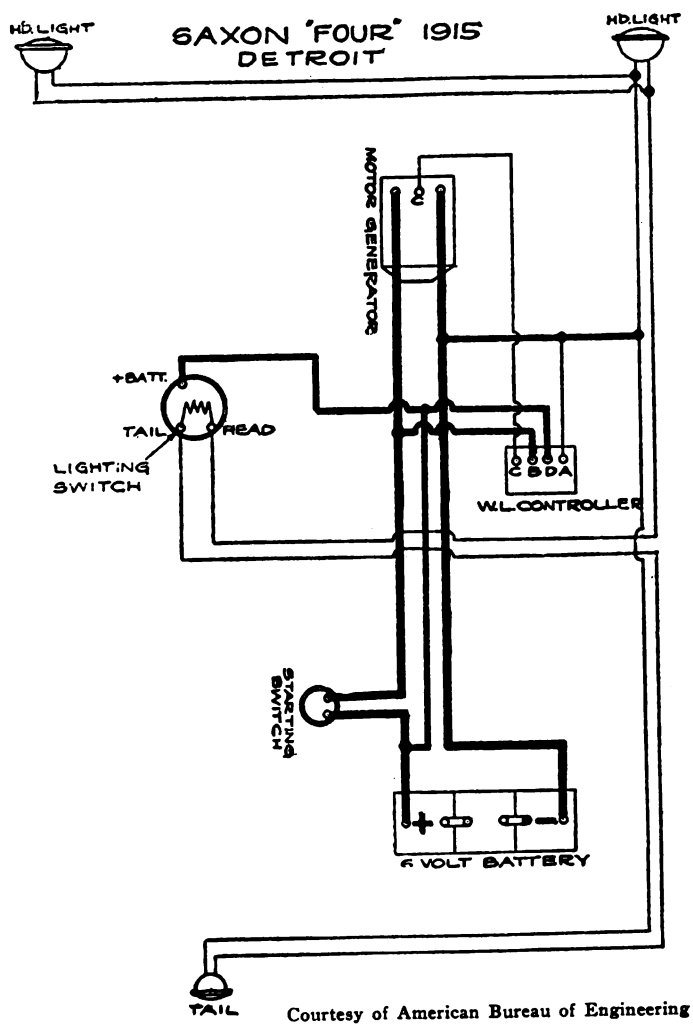
Reply: We print herewith wiring diagram which you request.

Remagnetizing Magnets

2994

From H. C. Gabbert, Pennsylvania: Can you tell me how to remagnetize magnets? I have a remagnetizer and I want to know which way I should put the magnets on. Should the North pole of the magnet be placed to the North pole of the remagnetizer or to the South pole of the remagnetizer?

Reply: In remagnetizing permanent magnets from an electro-magnet, the unlike poles should be placed together. That is to say the South pole of the permanent, steel magnet should be placed against the North pole of the electro-magnet. In order that no mistake may be made the current should be turned on into the electro-magnet and the steel magnet brought near to the poles. There will be considerable attraction of unlike poles for each other but very little attraction for like poles.



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An Electrical Problem

2995

From Chas. S. Woolsey, New York: A little problem in reference to electricity generated by a low tension magneto for lights on an automobile confronts me, and because I believe that you may be able to help me—I put it up to you.

Can this be done, and approximately at how many revolutions would the magneto have to run to give a current of six volts or how many volts could be generated? Would it be necessary to use a cut-out on the line, provided you were using the current direct from the magneto to the lamps? Would the ground wire from the magneto through the lamps and then grounded to the frame of the car deliver the current, or would it also ground the high tension magneto current that furnishes ignition?

This car is not electrically equipped, other than the Bosch High Tension Magneto. I shall appreciate any information you can give me.

Reply: Your questions cannot be answered simply because of the varying factors entering into your problem. However, we will do the best we can to cover the situation.

Theoretically it would be possible to build a magneto which would generate any amount of voltage or amperage at any number of revolutions per minute. Thus it might be theoretically possible to build a machine which would produce 1000 volts or more and as many amperes if the armature turned even one revolution per minute. So it might be possible to generate less than one volt and less than one ampere if the thing ran at 10,000 R. P. M. It is simply a question of design. Let us consider a few of the popular magnetos.

The Ford magneto will generate 6 volts at a speed as low as 250 R. P. M. K. W. Magneto will generate 6 volts at a speed of between 100 and 150. The Bosch low tension lighting dynamo gives a fairly steady current which remains fairly constant between 150 and 1500 R. P. M.

In general the machines are arranged to give maximum voltage at about 1500 R. P. M. and start generating at less than 100. It is safe to say that a good magneto will give ignition current at 200 R. P. M. or less and not an excessive amount at a speed as high as 2000. They are usually self regulating, but only to a certain extent because they are not dynamos. Few of these machines make satisfactory lighting generators because the change in voltage and amperage soon burns out the lamps.

A cut-out is a device which prevents the storage battery from discharging back through the generator. You would not need such a device unless a battery were used, you could not use a battery in connection with a magneto, simply because a magneto generates alternating current. (If it generates direct current it is termed either a "dynamo" or "generator" not a magneto.)

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The current from any magneto may be used through two wires or through a grounded circuit, regardless of whether the magneto furnishes ignition current or not.

Cleaning Ford Radiators

2996

From G. H. Pike, Massachusetts: Will you kindly tell me what I can use in the radiator of my Ford car to clean it out? We have good water here, but I placed a certain chemical in the radiator to stop a small leak, and I think that may have had something to do with the engine heating.

Reply: Drain the cooling system entirely and pour in a mixture of one pound of potash lye dissolved in a pailful of water. Add water to the system until it is filled and start the engine. Run the machine for about 20 minutes and drain off the solution. Fill the system with pure water and run the engine again for about 20 minutes. Drain off this water and flush out the whole system with the hose, leaving the drain cock open while flushing it. After this treatment you may be obliged to replace the hose connections with new ones, but do not replace them until you are sure that the system is clean. If you still have trouble, use a solution of washing soda (one pound) and water.

By several repetitions of the potash or washing soda solutions you will probably clean the system entirely.

If you want to go to the trouble of removing the radiator from the car, do so and plug up the two big openings. Fill the radiator with either of the above solutions and let stand for an hour. Flush clean with plenty of pure water. An occasional shaking of the radiator while the solution is in it will help matters.

Wiring of a King 1914

2997

From Fred D. Realy, Indiana: Will you kindly publish the wiring diagram of the Model B, King? I understand that this is a 1914 car. I am having a great deal of trouble with this wiring, and therefore hope to see the diagram printed.

Reply: We are printing herewith wiring diagram of the King Model B, 1914, equipped with the Ward Leonard system.

Chevrolet Overheats

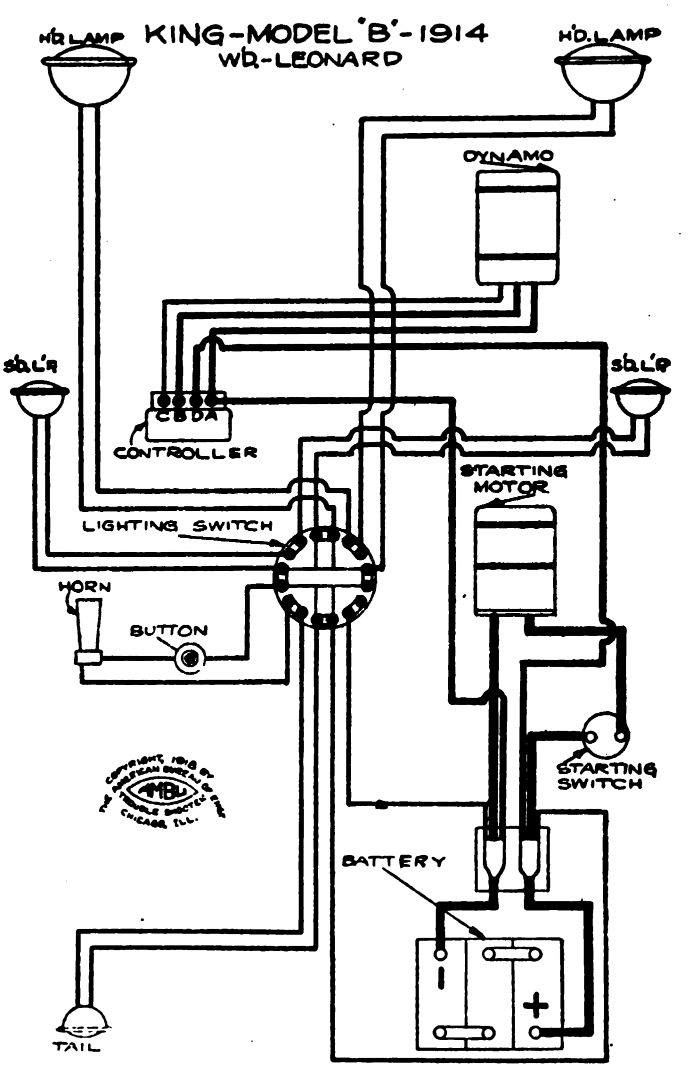
2998

From A. E. Sarvis, Pennsylvania: I am very much pleased with the AUTOMOBILE DEALER & REPAIRER, but like the trouble department in particular. I have a Chevrolet (490) 1916 Car. I have had some trouble with it, because of the fact that it heats up. I have done everything that I know, but this trouble has not been rectified.

I put in new piston rings, and "took up" the bearings. I can have the spark advanced, open the damper in the hot air pipe and even at that it only runs about ten miles before it is boiling, and before long it steams. It does not seem to decrease the power, but I should like to know how to overcome this trouble.

Can you help me?

Reply: First, remove the radiator cap and start the engine at a normal speed. Under normal conditions the



Courtesy of American Bureau of Engineering

water pump will force water into the top of the radiator and you should be able to see a fairly large stream entering the top of the radiator, from the engine. If this is not the case, then the trouble is due to a disabled pump, or a pump wrongly assembled. Remove the cover and examine the water impellor blade in the pump. You may find that the impellor does not turn with the shaft indicating that the driving pin has sheared off. If this is not the case it is possible that the impellor is put on in a reversed position. We give herewith a sketch showing how the impellor should be placed in relation to the shaft. Note that the arrow shows the direction of shaft rotation.

If, on the other hand you find that there is a big stream of water entering the top of the radiator and that the water runs over the top of the filling opening it is an indication that the passages through the radiator are stopped up and

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the water cannot circulate fast enough. Remove the radiator from the car and clean it thoroughly. A strong solution of washing soda and water or of potash and water will often do the work. Possibly there is a stoppage due to accumulations of solder at the top of the tubes. In this case it is a job for a radiator repair man.

Clean the radiator from the inside by forcing a stream of water through it. Frequently road dust and mud accumulate in the fins of honey-comb. It is just as important that the radiator be clean on the outside as inside.

Next examine the valve clearances. Possibly you have left too great a clearance in the exhaust valves and the burned gas cannot escape quickly enough. Check over the spark and valve timing. The spark should occur at top center when fully retarded. The intake valve should open after the piston has traveled 1/16 of an inch downward on the intake stroke.

If you still have trouble and have eliminated all of the points so far described it will be necessary for you to clean out the water jackets in both the engine block and head. This work may be done with a set of carbon scrapers and sharp wires. Finally with washing soda or potash as described for the radiator.

Wiring of Overland, Model 86

2999

From F. E. Niebanck, New Jersey: Will you kindly publish the wiring diagram of the Overland Model 86, 1915 model?

Reply: We print herewith diagram of the wiring that was used on the Model 86, 1915, Overland car, equipped with Autolite system. This wiring was also used on the 1916 Model.

MIXTURES FOR POOR GASOLINE

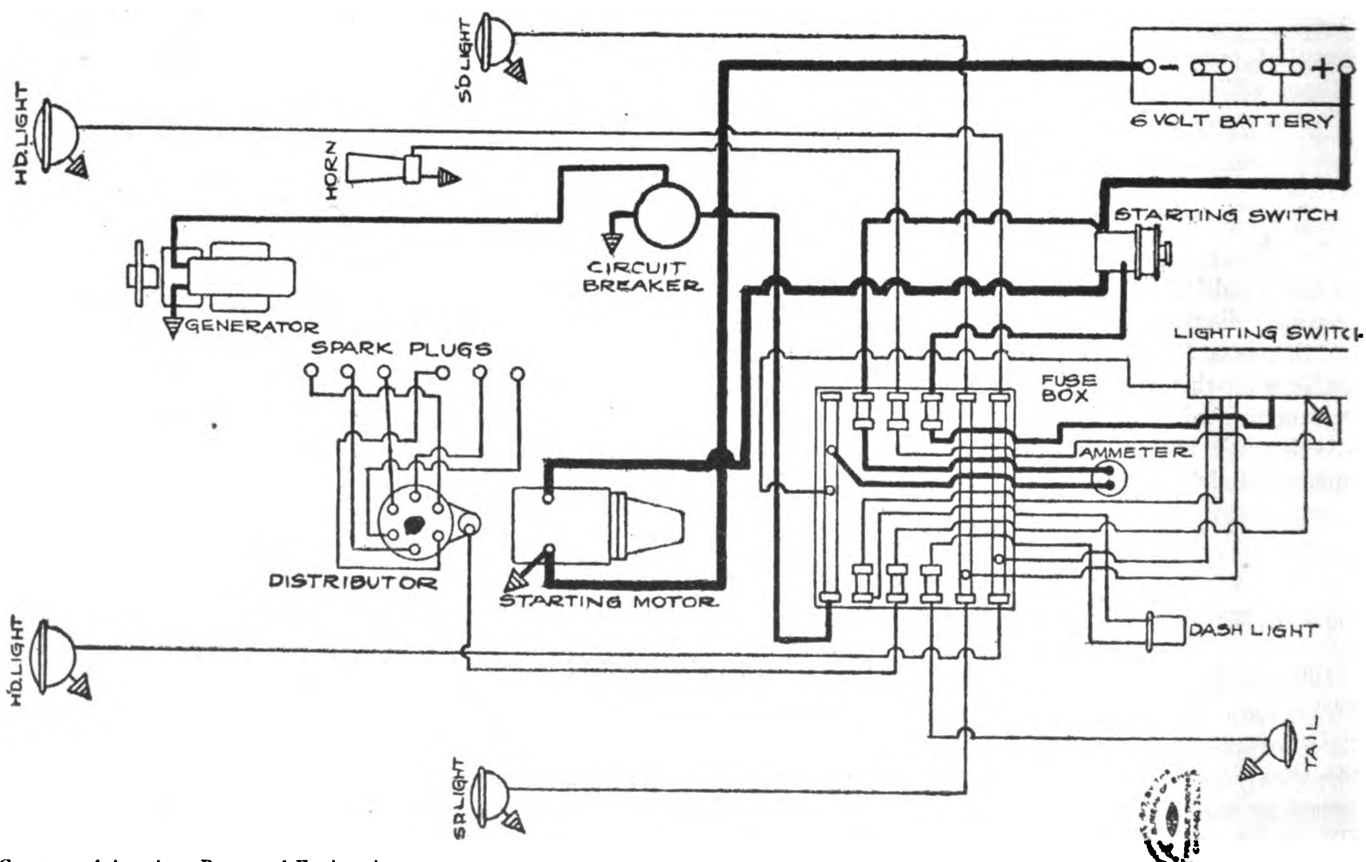
By George G. McVicker

Any gasoline with a low gravity test reveals itself when the engine is laboring hard. When the car is climbing a hill or pulling through bad roads it is plainly shown.

By experimenting with the common aniline oil such as is obtained from coal tar, and which is used as coloring matter, it will be noted that the bad effects of the poor fuel can be overcome. This can be obtained from most druggists at a cost which will keep the fuel economy about equal with that of high test gasoline. About three ounces of this oil may be placed in the fuel tank with every gallon of gasoline to obtain the best results.

It is in no way harmful to any of the engine parts and although the economy of this is questionable there are times and places where its benefit may be easily noticed.

The fellows who make the spectacular catches in the outfield don't do it by standing still waiting for a fly to come their way.



Courtesy of American Bureau of Engineering

Wiring of Overland 1915-16 Autolite System. Model 86

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New and Useful Automobile Accessories

The Turn-Auto

The Turn-Auto, a device which is being sold by the Turn-Auto Corporation of 149 Broadway, New York City, is a practical machine which should eliminate the need for creepers and pits and make the repair of an automobile a practical "handy, surface" job. It enables the mechanic to work in a natural position, on any of the underneath mechanism of the car as easily as though the parts had been taken out and were on the bench.

The Turn-Auto is a steel cradle upon which the car may be run by its own power, or pulled by a winch which is part of the device. The chassis of the car is then secured to the track by means of chains and turn buckles, and the car may then be turned to any angle up to 90 degrees by means of a shaft and suitable gears.

Repairmen will easily appreciate the fact that this machine is as much of a utility tool, where work on cars is being done, as the engine stand which has recently come into its own.

The New Zwebell Two-in-one Vulcanizing Mold

To the Zwebell Bros., of 482 Milwaukee St., Milwaukee, Wisconsin, may be given the credit for producing one of the first vulcanizing molds that adequately meets the requirements of the new trend in tire manufacturing—the making of over-size tires in almost every size from 3-inches up. With admirable foresight Zwebell engineers anticipated this pref-

erence for the over-size tire and have been working for some time past on a mold that would accommodate either standard or over-size tires without injury to either type.

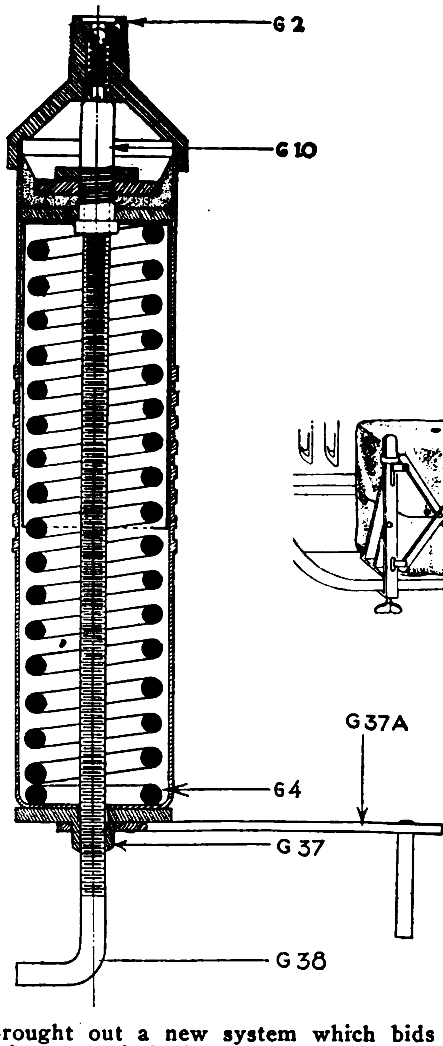
Before the advent of this new mold, the usual 3¼-inch mold was much too small for the over-size 3½-inch tire, which is close to 4 inches in width. This necessitated using the "squeezing in" method which invariably resulted in damage to the tire.

On the other hand, the standard 3-inch tire had to be "forced" down in the mold to fit the usual 3¼-inch model, the cavity being far too large for a snug fit. This also was a damaging method.

The new Zwebell mold, with its split aluminum reducing shell, enables the operator to handle the regular size and the over-size tire in the one unit—without either tire being distorted in any way

The Romon Oil Gun

Roberts and Monroe, Inc., of 35 Warren St., N. Y. City, makers of the Romon automatic chassis lubricator, have just



brought out a new system which bids fair to revolutionize chassis lubrication. The new Romon oil gun is, in itself, a complete chassis lubrication system.

The Romon oil gun consists of a nickel plated metal bottle in which are located a piston and a heavy coil spring. The oil is contained in the upper part of the bottle and is prevented from leaking through the delivery end by a ball check valve.

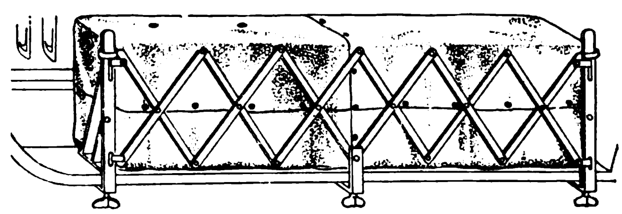
Oil pressure, inside the gun, is generated by the force of the large coil spring compressed through the feed screw (G38) as shown in the sketch. It is said that a pressure of 165 pounds per square inch can be obtained with practically no effort on the part of the operator.

To complete the system, the grease or oil cups which form the average car lubricating equipment, are replaced with special Romon fittings. These fittings are equipped with a device for releasing the ball check in the end of the pump.

When using the device the long threaded handle (G38) is inserted and twisted until the plunger is at the top of its stroke. The oil cover is then removed and the device filled with oil. Upon replacing the oil cover the rod (G38) is removed and the gun is ready for service. By pressing the end of the tube against the special fittings on the car, the ball check at G2 is released and oil is fed, under pressure by spring G4, to the bearings.

Star Adjustable Luggage Carrier and Case

During the summer season the motorist, who takes any amount of baggage, usually finds that the baggage compartment of his car is very limited. The general practice is to stow the excess luggage on the running board, but there is always a danger of loss and in addi-



tion the baggage is exposed to the elements.

The Star Specialty Mfg. Co., 227 West Erie St., Chicago, Ill., are making a luggage carrier which has a number of interesting features. The Star carrier is made from steel on the "lazy tong" principle. It may be contracted or extended to fit the size of the bundle or box which is put in it. Wing nuts on the bottom enable the operator to clamp the luggage in it safely. The case, which is made from "Fabricord," (an automobile top material), is water, mud and dust proof.

No-Float Carburetors

The Health Products Corp. of Detroit, Michigan, are the manufacturers of No-Float Carburetors which are being widely used.

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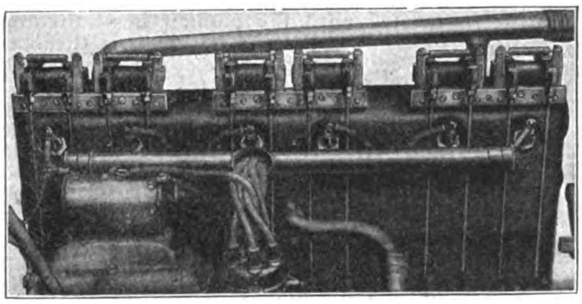
Newton Products

The noise of the overhead valve system of the Buick it is claimed is due principally to play or side-slap of the rocker arms. It is practically impossible to adjust the push rods without first eliminating this side-slap, which naturally becomes more pronounced as the parts become worn.

It is said the Newton Valve Silencer does this very thing, not in a makeshift manner, but mechanically and for all time and when attached becomes a part of the motor without interfering in any way with its adjustment and care.

Slotted brass collars are placed on ends of rocker arm pins, over the cotter pins, which are not removed, and against these collars by spring pressure, press the arms of Silencer, thus holding the rocker arms against bracket where they oscillate freely and without side motion, noise, excessive wear, or constant oiling. The rocker arms being held in their permanent correct position, the push rods can be accurately adjusted, insuring uniform valve action and a



smoother running motor than is possible with the side play of rocker arms not controlled.

Old motors are made quieter than when new and they remain so (if push rods are adjusted occasionally) there being nothing to break or become disarranged and the overhead valve mechanism becomes as quiet and smooth running as the enclosed type.

Another Newton product is a new-style oil cup. It is said to be really a lubricating system.

Those bearings that are inaccessible and those where a plug must be removed for oiling are sure to be neglected. This is especially true where heavy oil (as steam cylinder or 600-W) is used, as it is practically impossible to get a sufficient quantity of oil into bearing without using an oil gun.

One of the most important, the steering gear, is most often neglected, resulting in a worn gear, hard steering and often an accident that would never have happened if the steering gear had been properly lubricated.

Other bearings are worn, become noisy and eventually useless from this same neglect.

With the Newton Newcup it is only necessary, when occasionally oiling up, to open cup, fill with oil (light or heavy) close the cup and the necessary quantity of oil gets to the bearing.

It will pay readers to get full particulars and all the advertising material regarding these perfected products.

Address all correspondence to the Newton Manufacturing Co., Plainville, Conn. All letters will be answered same day as received. Advertising literature of many other Newton Specialties will also be sent with full explanation.

Special Bargains in Lathes

During the war the J. A. Fay & Egan Company of 400 West Front Streets, Cincinnati, Ohio, specialized in building 16 a nd 18-inch swing, eight foot bed lathes for the Ordnance Department of our government. The lathes were necessarily of high quality and the best workmanship in order to pass the rigid examination given by the government inspectors. At present this firm has a few of these lathes on hand and are offering them to the trade direct which means a saving of 12½% on the agent's discount.

Since the number on hand is limited and since the company, for advertising purposes, desires to make as wide a distribution as possible, only one lathe will be sold to each customer.

The lathes offer a wide range of speeds for turning and will cut a wide range of pitches. They are built for general work and should be of great utility to garages and repair shops.

The Schrader Policy

The policy of A. Schrader's Son, Inc., of advancing to positions of trust young men whom they have specially trained in their own organization has resulted in the appointment of Harry E. Geib to the post of Manager of the Schrader Chicago Office. Mr. Geib entered the employ of the Schrader firm in March 1916 as a junior clerk in the Accounting Department. Upon evidence of unusual executive ability he was transferred to the Order Department and from there was promoted to the Assistant Manager's Office.

DeLuxe Special Oversize Piston

The Clark-Turner Piston Company of Los Angeles, manufacturers of the well-known DeLuxe light weight cast iron piston, have produced something entirely new in their special oversize piston now on the market.

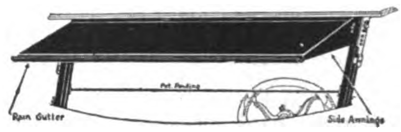
The DeLuxe Special Oversize is, as the name indicates, a special piston made just for oversize and is not a makeshift adaption of the standard size. It is cast on an oversize core and, when finished to the desired size, the wall is of practically the same thickness as a DeLuxe standard piston. For this reason there is but a fraction of an ounce difference in weight between the standard size DeLuxe and the oversize DeLuxe.

The manufacturers claim that this Special Oversize is at least fifty per cent lighter than a stock factory oversize cast iron piston.

This new piston will surely be welcomed with enthusiasm by the trade as the many advantages and possibilities which it possesses are obvious.

New Era Auto Visor

An automobile visor that "sheds the rain like the prow of a boat" is the latest offering of the New Era Spring & Specialty Co., Grand Rapids, Mich. The new visor, which is made of an unusually heavy grade of pressed steel, is provided with a gutter at its lower edge into which the water flows and is thus carried to the ends of the visor, whence it flows off and past the sides of the car instead of blowing back on the upper half of the windshield.

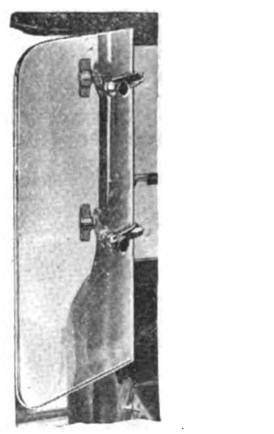


This is a feature which is embodied in a few other visors, but the New Era goes a step farther and provides both ends of the visor with a metal awning, or gable end which overcomes the tendency of the rain to eddy around the ends and wet the windshield glass usually just at the spot in front of the driver's eyes

Perhaps the best that can be said about the New Era, or any other visor for that matter, is that it works. And that's what the New Era people claim for it in addition to the further detailed facts of heavy baked-on black enamel on the top and dull green finish underneath, together with its easy adjustability to the height of the driver's eyes when installation is made, which also is very easy.

Star Wings

An automobile windshield, though it deflects the direct breeze from the front, does not prevent back drafts which cause annoyance to the driver and those on the



front seat. Such drafts can be prevented by windshield wings, devices which clamp upon each side of the windshield and deflect the wind away from the car.

Star Wings, illustrated herewith, are made by the Star Wing Co. of 170 W. Randolph St., Chicago, Ill., and may be obtained in a number of colors as well as plain glass.

The method of holding Star Wings to the windshield is unique in that no holes are drilled in the glass. Two long clamps press against the sides of the wings and fasten to the windshield hangers.

The bronze part of the fittings are heavily nickeled to prevent any chance of rust, while the steel parts are Parkerized. The glass comes in regular lengths of 18 or 20 inches with plain or beveled edges.

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Taking the Ire out of truck tires

NOT so long ago shops had to be especially equipped to remove worn out truck tires and even with the necessary press it was no easy job.

Now, thanks to the oxy-acetylene cutting torch, the most stubborn tires are sliced off quickly and economically without in any way damaging the felloe band.

Prest-O-Lite Dissolved Acetylene has increased the usefulness of oxy-acetylene a hundred fold because it enables *any* shop to employ the process.

Through a nation-wide system comprising forty plants and warehouses an unlimited supply of highly pure gas is constantly available to welders and cutters the country over.

Prest-O-Lite

DISSOLVED ACETYLENE

THE PREST-O-LITE COMPANY, Inc.

General Offices: Carbide and Carbon Building, 30 East 42nd Street, New York

Balfour Building, San Francisco

In Canada: Prest-O-Lite Co. of Canada, Limited, Toronto

PW-508-21

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Alsop All Spark Correction

In our May issue, on page 16, the advertisement of the All-Spark Ignition Company of 13 Water St., N. Y. City, Department E., carried an error in the price. The price on this device should have been advertised as $7.50 instead of $7.05 as shown in the advertisement.

The All-Spark device is what might be termed a "variable and adjustable spark gap." In addition to its adjustable gap feature, the device has a condenser action which tends to increase the voltage of the secondary current and cause the spark to leap across the spark plug electrodes even through the plug may be fouled with oil or carbon.

The Koupet Top

An automobile cannot be 100 per cent useful unless it can be used throughout the whole of the year. The regular Ford models of open cars are decidedly uncomfortable in the fall and winter months.

In these days of "custom made" things, however, one may buy almost anything to fit standard models and the case of the Ford car is no exception. It is possible to obtain a custom built, closed body for any model of the Ford car at a decidedly low price.

The Koupet Top is such a device. With a Koupet top on the Ford car the machine has the appearance of a costly all weather car. We should advise our readers, who are interested in obtaining 100 per cent efficiency from their cars to investigate this top. H. G. Paro Co. of 1412 South Michigan Blvd., Chicago, Ill., are the sole distributors of the Koupet top.

Mechanism Springs

Although the mechanic has come to realize the importance of maintaining a good supply of automobile springs, he has not yet waked up to the fact that it is even more necessary to carry a line of mechanism springs.

Speedometers, ignition units, brakes, and many other units on the car cannot function without small springs and if the repairman wants to keep his customers satisfied he must be in a position to replace these small springs.

The Peck Spring Company of Plainville, Conn., make all kinds of small coil springs and we should advise our readers, who really have the interest of their customers in mind, to write this company for their latest catalogue and prices.

An Interesting Booklet

We wish to call the special attention of our readers to a little booklet called "Testers and Intensifiers" also a cardboard model of a "Valve Timing Chart." Readers who are interested in obtaining this class of automobile information should wire to Charles H. Peck, 2154 N. Carlisle Street, Philadelphia, Pa. A small charge is made for the booklet and the chart. There are very few mechanics who properly understand Valve Timing, and the information contained in the chart and the booklet is extremely practical and valuable to any repairman working around a car.

75% Increase In No-Leak-O Sales

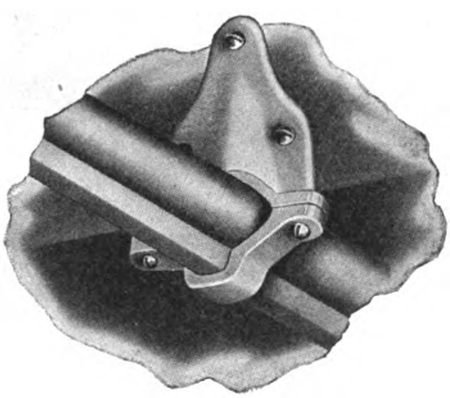
Reports from Baltimore, Md., the home of the No-Leak-O Piston Ring Company, state that the sales of the well-known No-Leak-O Piston Ring for the first three months of 1921 show an increase of more than 75% over the same period in 1920.

The story of how the No-Leak-O Company were able to take care of this remarkable increase in business furnishes an interesting side-light on one of the reasons why this ring has attained such a wide sale throughout the country.

During the slump in the Automobile Field last fall many manufacturers immediately curtailed production in their factories. But the No-Leak-O Company, seeing through the misty clouds of depression the resumption of business which it believed would soon take place, wisely continued to produce at the normal rate, storing the rings in their warehouses. As a result, the No-Leak-O Company was prepared to make immediate shipments when business again opened up and orders for their product began pouring in.

Bull Dog Steering Column Support

The average Ford car owner does not realize the fact that a large part of driving fatigue is caused by steering column vibration, but this is true, and is augumented when the car is being driven over rough roads.



If the Ford car owner will install a brace which will rigidly fasten the steering column to the instrument board, then his comfort will be largely increased. Such a device is made by the Tungsten Mfg. Co., of Marshalltown, Iowa, and illustrated herewith.

The Bull Dog steering column support, as it is called, is a light but strong aluminum casting which firmly locks the steering column on to the instrument board. The device is given a satin finish and harmonizes with the fittings on the board.

B-N Announcement

The B-N line, consisting of B-N Piston Pins and automobile accessories, and Bur-Nor Hardware Specialties will be sold to the jobbing trade in Minnesota, Missouri, Iowa, Kansas and Nebraska by Mr. H. F. Libby of Kansas City. Mr. Libby is very well known to the buyers in that section of the country, and has had years of experience in the automotive line.

Vulcan Windshield Visor

The Jenkins Vulcan Spring Co., of Richmond, Indiana, announce a new windshield vizor adaptable to any car. "The Vulcan Vizor," as it is called, is to be had in three types. Each fits solidly over the windshield in such a manner as to shield the eyes of the driver from sun, headlight glare, or mist.

Features of the Vizor include a gutter at the front edge which drains off rain that would otherwise strike the windshield. The Vizor's construction enables it to harmonize with the car to such an extent that it appears an integral part of the car itself, rather than an addition. It is a one piece job of rolled steel, finished with baked black enamel, and cannot rattle or work loose.

Type A is exclusively for closed cars having straight fronts. Type B is an adjustable vizor for all open cars, folding back inconspicuously into the top when the top is lowered. Type C, is designed to fit any closed car irrespective of windshield slant.

These Vizors are now ready for distribution through the jobbing trade.

Guarding the Motometer

During the past few years the motorist has been confronted with an ever increasing danger of having his motometer stolen. Each year the number of motometers taken by thieves is multiplied at a costly and alarming rate.

The Up-To-Date Machine Works, Inc. 2913 S. Wabash Ave., Chicago, Ill., has perfected an accessory that positively eliminates all chance of loss from theft.

Protect-O-Cap is the name of this new device which is made of polished aluminum and matches the trimmings of the car perfectly.

The moment Protect-O-Cap is placed on a car it **becomes a part of that car** and neither it, nor motometer can be detached by an unauthorized person without damaging them to the extent of making them unsalable. There are no keys to bother with.

This new motometer protector performs other duties—it adds greatly to the grace and beauty of the motor car—makes radiator filling much easier—does not interfere in any way with the perfect performance of motometer. Protect-O-Cap is made in two models to fit all cars.

Columbia Dry Batteries Drop in Price

Announcement has been made by the National Carbon Co., Inc., Cleveland, Ohio, of a substantial reduction in prices of all standard types of Columbia Dry Batteries. This reduction in price includes the following brands of dry cells and unit batteries manufactured by the company: Columbia Ignitor, Columbia Gray Label, Columbia Red Label dry cells, the Columbia Hot Shot and Columbia Multiple Unit Batteries and the new Columbia Bell Ringer battery. The three, barrel assortments, consisting of different combinations of Columbia Ignitor dry cells, Columbia Hot Shots, and Columbia Bell Ringer unit batteries have also been included in the price reduction program. All new prices were effective as of June 1st, 1921.

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"BULL DOG" Bounce Absorbers

Fit All Cars

ONE SINGLE STYLE, at one single price, takes care of cars of all weights and models. Quickly adjusted to suit cars of any weight, springs of any rigidity, or the preference of any driver.

No other bounce-absorbing, or so-called "snubbing" device has this feature of instant adjustability.

No stopping on the road to adjust "Bull Dog" Bounce Absorbers for "country driving" or "city driving."

This is the only device that operates equally well at 10 or at 50 miles an hour.

Easily attached; needs no oiling; has no metal parts that will wear and break.

No other shock-absorbing device can approach "Bull Dog" for its classy quality—at so low a price.

Chart inside carton tells plainly (with diagram) just how to apply to all cars of various makes—write today—don't put it off.

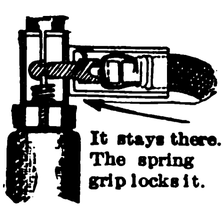
Channon Hughson Co.

227 West Erie St. Chicago, U. S. A.

BAYLEY'S AUTOMATIC

INSULATED SPARK PLUG TERMINAL

For Automobiles—Motorcycles —Motorboats—Aeroplanes

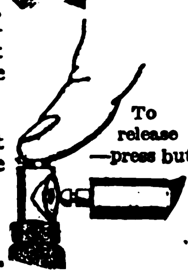


It stays there. The spring grip locks it.

Instantly connected—instantly disconnected. "The Button does it!" Forms a rigid contact. The Spring locks it! Attached by hand—no tools needed. Transmits a stronger spark — gives added power. Prevents short circuits, shocks and burnt fingers. Practical—time saving — economical. Highest quality. To introduce them we will give

4 B. A. T. Terminals for $1.50

with a money back guarantee if not satisfied. Jobbers and Dealers write for proposition.



To release plug —press button.

B. A. T. Terminal Co.

105 Vandervoor St., Brooklyn, N. Y.

A "Yankee" Ratchet Drill No. 1555 can put a shop on a paying basis

Here's a drill that never falls down on a job because "it can't be done." When other drills are lying idle, the "Yankee" No. 1555 will be found drilling away.

Where working space is limited—hardly room to move the fingers—is the place where the No. 1555 shows up the best.

Has five adjustments—Plain Drill, Left-hand Drill, Right-hand Drill and DOUBLE Ratchet. On this adjustment move the crank *forward*—as little as an inch and it cuts. Move the crank *backward* just as little and it cuts then, too. A continuous drilling operation—no lost time, or wasted effort.

Has two speeds. Move the little lever at the hub of the crank and the speed is changed instantly, in the fractional part of a revolution and without removing the drill from the work.

No. 1555—Length 17 in. 3-jaw chuck for round shank drills up to 1-2 in. diameter.

No. 555—Length 17 1-2 in. 2-jaw chuck for holding round and square shank drill.

Some Other "Yankee" Tools

Spiral Screw-Drivers, Quick Return Spiral Screw-Drivers, Ratchet Screw-Drivers, 1 1-2 to 30 in. blades, Ratchet Hand Drills, Ratchet Chain Drills, Ratchet Bench Drills, Automatic Push Drills, Ratchet Tap Wrenches, Bench Vises.

Dealers Everywhere Sell "Yankee" Tools

WRITE TO-DAY

for this helpful "Yankee" Tool Book," mailed free upon request. Contains over a hundred illustrations, showing tools in use and arranged for easy selection.

NORTH BROS. MFG. CO., Philadelphia

"YANKEE" TOOLS

Make Better Mechanics

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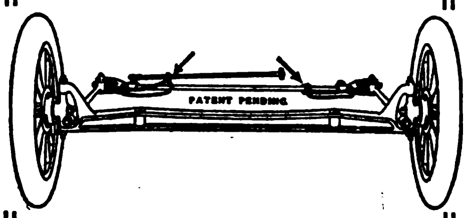
"Little Giants"

Registered

Insure Better Steering

Stop the Rattle



For Fords

Maxwell, Dodge and all light Cars

Insure better steering control, less skidding, less wear on front tires, rods, joints and knuckles. Prevent rattle and vibration—cut down repair costs.

"The Biggest Little Thing on My Ford!"

That's What Users Say

Installed in a minute—weigh 5 ounces—you simply snap them into place. Made of highest grade steel spring wire, especially tempered.

Ten-Day Trial!

Go to your dealer today and buy a pair of "Little Giants" Springs. If, after ten days' trial, you are not convinced, your money will be returned. Beware of imitations. Demand the genuine—each pair packed in ind.vidual carton with our money-back guarantee printed thereon.

50c per pair. Everywhere 50c

Sold by leading Jobbers and Dealers

American Auto Products Co.

243 So. Broadway Denver, Colo. 623 So. Wabash Ave. Chicago, Ill.

Nu-Life Piston Ring Expanders

As a general rule the life of a piston ring is limited by its resiliency. Old rings, after wearing into place are often more efficient, as far as fitting goes, then new ones, and would be satisfactory if they retained their "springiness." But the tremendous heat of the engine and the constant bending action usually removes the "spring" of the ring before it really fits the cylinders.

The American Auto Products Co., of 1319 L. Street, N. W. Washington, D. C., are making a device called the Nu-Life piston ring expander, which they claim will give new life to the piston rings.

The Nu-Life device consists of a ring of spring steel which carries a number of projecting fins. These projecting fins are designed to press against the inside of the piston ring and cause the latter to press tightly against the cylinder wall.

The manufacturers claim that their device will not be affected by the heat of the motor and will retain its resiliency indefinitely.

Merited Success

Remarkable success has been achieved by the Cleveland Branch of the Motor List Company. This branch was opened in November, 1918, with two thousand square feet of floor space at 636 Huron Road. Through rendering exceptional service to customers the organization has grown in two and one-half years until it numbers at the present time seventy people.

Negotiations recently completed give the Motor List Company a most desirable lease on the entire fifth floor of the building at 1270 Ontario Street—ten thousand feet of floor space, well ventilated and lighted, providing room for further expansion and making possible the improvement of service in a number of respects.

The Motor List Company, with home office at Des Moines, is the largest organization of its kind in America specializing in imprinting, multigraphing, addresing, mailing, with a large volume in automotive lists and statistics.

Other branches are maintained at Detroit, Philadelphia and Newark—each with a complete local organization.

Milwaukee Timer

The Milwaukee Auto Engine & Supply Company, Milwaukee, Wisconsin, manufacturers of the Milwaukee Timer for Fords, are working at 100 per cent capacity, turning out 4,000 timers per day. In fact their chief difficulty is keeping up with orders, it is said.

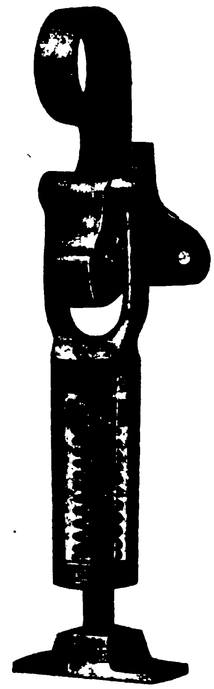
According to Harrie R. Williams, director of sales and advertising, April has proved to be the biggest month in their history. It should be noted here that their business for March, 1921, on timers exclusively was 15 per cent greater than their bumpers which they have since discontinued.

Underlying this sweeping success of the Milwaukee Timer is, of course, the quality of the article tiself. In general use wherever Ford cars are driven, this standard-design instrument has proven its durability and efficiency. It is recommended by dealers and garage mechanics in all parts of the country.

A New Hood Lock

The Ideal Brass Works of Indianapolis is manufacturing and marketing a new hood lock which is easily operated, claimed to prevent the rattling of the hood, is adjustable and is self oiling.

The hood lock is of the eccentric type which permits the lock to be operated



with but one finger and which also permits the use of a very much stronger spring than is now used in the present type of hood locks. The eccentric locking element is associated with the hood catch such that a two point bearing of the same is secured, which positively prevents rattling of the hood.

The hood lock is adjusted by rotating the concentric support or lock body, on the anchor bolt which lengthens or shortens the lock as desired. The lock body carries an absorbent pad, which contains sufficient oil for lubricating all moving parts. Each time the lock is released the anchor bolt automatically is forced into engagement with the absorbent pad, which lubricates the moving parts.

Great care and pains have been given to create what is most desired in service, beauty of design and appearance and which also embodies the above unique features. All exposed parts are made of brass and are all highly polished and nickel plated. While the hood lock will be found on many high grade cars, the coming season, the manufacturers are prepared to supply the trade and individual users and welcome any inquiries.

Gilmer Round Type Endless Belt

The L. H. Gilmer Co. has extended its Woven Endless Fan Belt line to include every automobile using a fan belt through the introduction on April 1st of the Gilmer Round Type Endless Fan Belt.

This belt is made to fit such cars as Chevrolet, Nash, Cole, Oakland, Winton, Packard, Pierce-Arrow, Westcott, Reo, Marmon, Velie, Oldsmobile, Scripps Booth, Jordan, Roamer, Sheridan, Hupmobile, etc.

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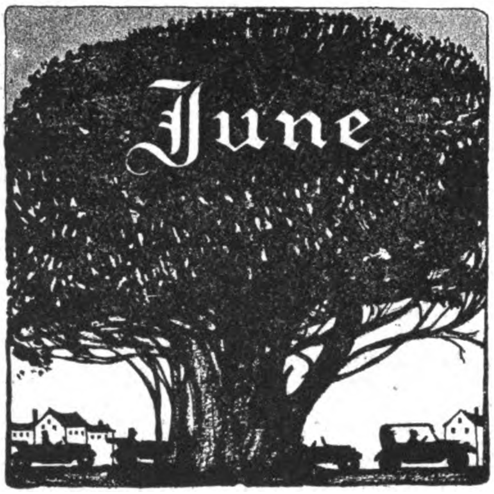

IMPORTANT NOTICE

THE MINUTE your eyes light on the above heading and you have recovered from the shock, you will grasp the tremendous possibilities, you will realize that we intend to say something about ourselves. As a matter of fact do you recall ever having seen an important notice, in a magazine, which did not have to do either with the Editor or the Management? Naturally you haven't because whoever heard of either an Editor or Publisher who considered anything important except his own business? (We trust you will pardon our candor,) The wise guys always try to squirm under a screen of camouflage and wiggle around the facts so as to make the poor misguided reader think that the notice is important to him. But in the last analysis you will always find that the real importance of conveying the message reacts to the ultimate good of the publisher.

Naturally we are entirely different from the rest and we would not, for a minute, consider the idea of letting our readers think that this notice is one-half as important to them as it is to us. This is why we are so candid and the notice so very important. But, at any rate, we want to give you some information which is of importance to you—therefore, read on.

Naturally we hesitate and blush a bit as we mention it, but the real brains of the magazine are in New York City. (We trust our printer will set this sentence just as it is written.) We shudder to think of what this big city would do if it were deprived of us. We dislike to consider leaving New York City without our guidance and for this reason we maintain our Editorial and business office in this city. Therefore be sure to mail all of your Editorial letters to our New York City office. Any letters which pertain to automobile troubles for the "trouble department" should also be mailed to this city. If, however, you do not agree with the Editor's policy and choose to mail him an infernal machine, or perhaps visit him with a "gat" it might be better for both of us for you to think that the said Editor were anywhere but in this office.

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VACATION AND TOURING NUMBER

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 71-73 Murray Street-New York City

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Vol. 31. No. 5. JULY, 1921 Monthly $1.50 per Year Single Copy 15 Cents

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Automobile Dealer and Repairer
REGISTERED IN THE U. S. PATENT OFFICE
VOL. XXXI. No. 5 JULY, 1921 PRICE { 15c per copy $1.50 per year }

FOR nearly five years I have looked forward to the time when I could write an article about automobile camping and say just as much or just as little of a practical nature as I wanted to. Always have I been limited by some narrow minded Editor who had ideas of his own. And now that I am, myself, one of those same "genus homos" of the Editorial family, I am limited by the policy of the magazine itself. I can't say what I want to because this is a mechanical magazine. I can't tell about the " * * * wild grandeur of the mid-summer night when one is comfortably reclining on a bed of pine needles with nothing but the twinkling stars above * * * " and so on ad indelirium. I can't work in a poem about the song of the blackbird and the warble of the screech owl. I can't do any of these things because they are not "mechanical" and so I'm just about tempted to call this story "Directions for Camping" and copy it from some old trapper's guide.

I suppose that there is plenty of humorous material to be obtained from a life in the open. The ants that mix so smoothly with blue-berry pie; the spiders that always build a web from the end of my cot to the bridge of my nose and use my mouth as a retiring room when I'm sonorously reposing in the open; the water-bugs which mingle so easily with the un-canned viands and the sand fleas

which seem to delight in personal contact inside the sleeping bag; all of these things might be passed upon with a noisy smile, perhaps, but this is a mechanical magazine, my friends, and perforce its Editor must set a good example.

And because this magazine is mechanical and because mechanical things are all accompanied with "directions for using," like the patent medicines which we buy for everything that ails us from falling hair to bunions, most of our stories must be in the form of "directions."

Before starting your camping trip, in your automobile, spend about half an hour, mentally, trying to be reasonable. With the great excitement attendant upon such a trip one can't always think along logical lines. One is prone to stock up with an extra dozen spark plugs and forget to fill the tank with gas; to buy an extra fan belt and leave it in the garage, and so on; but the trip can only be enjoyable if it is logically planned.

I'm going to risk hanging by telling some bitter truths. A camping trip is not one continuous round of pleasure. You may think that a bed of fir boughs under the midnight stars is ideal, but it is not always that. If the first ten thousand mosquitoes overlook your couch, the next six million won't. Pine needles have a habit of collecting ants and resin, strange as it may seem, and both of these accessories are not conducive to peaceful slumber.

Bugs cannot creep into air-tight sealed cans but after eating canned stuff for two solid weeks, one feels rather tinny inside. The water from the bubbling brook may not have an odor, it may appear as clear as crystal, but Oh Boy! Pure, or seemingly pure water, can have as much kick to it, when it is inside a resisting stomach, as "Kentucky Sunlight."

And when it comes to sleeping on the mossy knoll, one could rest more easily on the back-bone of a fretful porcupine. And I might go on indefinitely mentioning the fallacies which inhabit the upper story of the novice who is starting on his first camping tour.

If you intend to enjoy your

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trip you must not plan to change all of your habits. One who is accustomed to sleep, for 320 nights, per year, on a soft mattress or perhaps a feather bed, can hardly expect to get any rest on the hard, hummocky ground or on

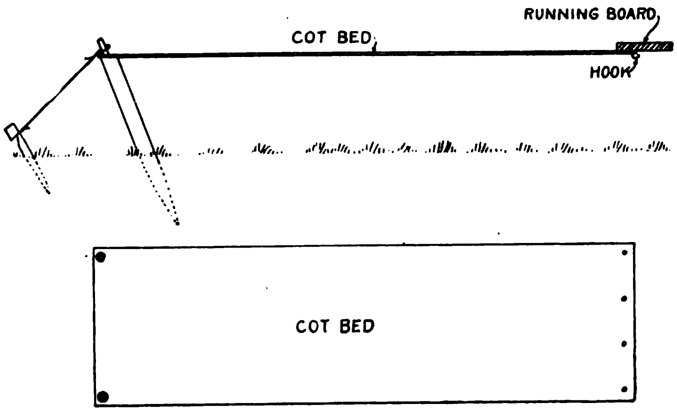

Fig. 1; Method of Setting Up Cot Bed and Illustrating How It May Be Fixed to the Running Board.

the sharp points of pine needles. Veteran campers can and do enjoy the ground as a sleeping mattress, but they are accustomed to it.

I don't know of anything which can mar a camping trip more than insomnia; insomnia brought on either by a poor bed or lack of air, or high temperature. One might sleep at a hotel, on the auto trip and insure proper sleeping quarters but the big advantage of such a vacation would be discounted. Properly outfitted, the auto camper can look forward to a pleasurable vacation.

The main thing to prepare for is the sleeping accommodations. A strip of canvas about a foot longer than the height of the person forms as excellent a bed as the most downy of feather ticks. The width of the canvas should be at least 18 inches and one end should be fitted with six metal eyes or grummets. The other end should have an eye at each corner. Six hooks, spaced three inches apart, on the underneath side of the running board serve to hold one end of the canvas while the other end is supported at the corners by upright posts with pins at the top to pass through the eyes. The posts are braced by two short ropes and a couple of tent pegs driven into the ground.

Such a "cot" is flexible and soft and can be rolled or folded into the minimum sized bundle possible. A double blanket and a sleeping bag complete the sleeping equipment. If the trip is planned through the country, however, one should carry a piece of cheese cloth as a protection against the mosquitoes.

Since so much depends upon sleep, I'm going to dwell upon this phase of the trip, particularly, and describe the method of "making" the bed.

An amateur camper will usually pick a place to camp in the woods, which is not policy. The ideal sleeping place is in an open field at the top of a hill which faces toward the breeze. The mosquitoes are not so apt to frequent such a spot as they are in the woods.

The automobile should be driven along the side of the hill and parked in such a way that the running board, with the hooks in it, faces toward the prevailing breeze. This will leave the opening of the "lean to" tent at the sides and so obviate any chance for rain beating in. The two stakes for the guy ropes are next driven in the ground and the cot pin posts, with the canvas stretched over them, erected as shown in the illustration.

If the night is cold and plenty of bed covering necessary, then the bed should be made with care. The veteran camper, accustomed to a cot-bed can roll up in a blanket and his worries are over, but the novice, accustomed to a commodious bed cannot sleep two hours without pushing off the blankets.

Personal habit has something to do with the making of a cot-bed. If you sleep on your left side the bed should be made differently than if you should sleep on your right side, strange as it may seem. The majority of people sleep on their right side, they turn or toss at first, but finally come to rest on their right side. In such a case the bed should be made as follows:

We will assume that the pillows, or head of the bed is toward the north. The edge of the blanket should be fastened, by cord to the west edge of the cot, at the corners. The blanket is then carried to the east edge and folded back again toward the west. This will bring a fold at the east side. The occupant should sleep between the fold. The two edges on the east side should be tied to the corners of the cot and the third corner at the south-west should also be secured in like manner, leaving only the north-west corner untied to permit one to crawl between the blankets.

If one sleeps on one's left side, the fold should come on the west side, if the head of the cot is toward the north. If you will make up your cot in this way you will find that you can sleep all night without "rolling off" the clothes.

When sleeping between blankets the rule is to have as many blankets below as above. If you sleep on plain canvas and pack a dozen blankets above, you may still be cold.

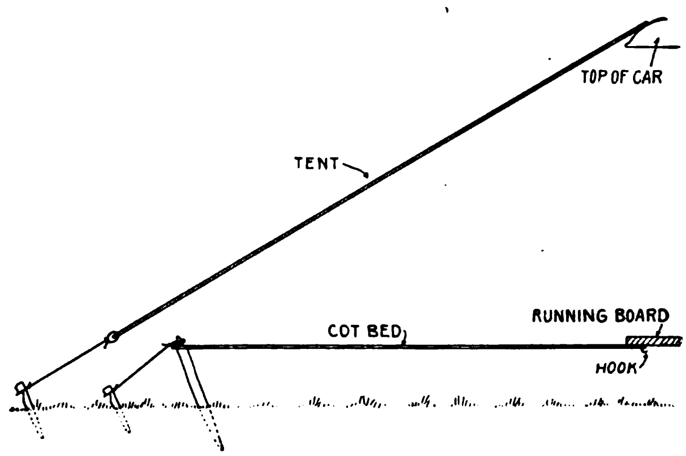

Fig. 2; The Tent and Cot Bed as Applied to the Ordinary Car; the Tonneau Forms the Dressing Room.

The sleeping bag is an easy thing to make, it consists of a double blanket folded along the long side and fitted with snap fasteners across the bottom and the other side. With this arrangement the blanket may be opened flat for airing in the morning.

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For a shelter on windy or stormy nights, the lean-to form of tent is the easiest and lightest to carry. It need be nothing more than a strip of canvas stretched from

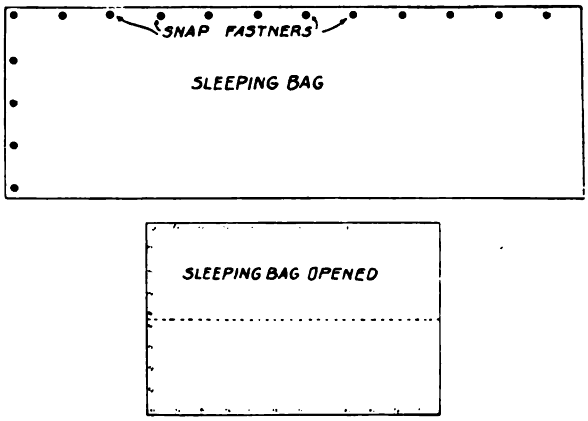

Fig. 3; The Sleeping Bag and How the Snap Fasteners are Placed.

the top of the automobile to the foot of the cot bed. It should extend beyond the foot of the bed about 12 inches and when fastened to tent pegs, the lower end should be a few inches above the level of the foot of the bed. This allows a circulation of air. Two, three cornered pieces of canvas are provided to fasten, with snap fasteners, to the top piece, to keep out the rain. If the night is pleasant the sides can be folded back over the top.

One cannot sleep with a hunk of mosquito netting over one's face and besides the mosquitoes can bite through it unless it is supported away from the head. I always plan to have the netting about two yards square and supported by a piece of string from the top of the car, thus making a miniature "tent" over the pillow. The upper end and sides may be tucked under the pillow and it is a wise bug who can find his way under the overhanging folds at the lower end.

The various illustrations accompanying this article will make the above matters clear.

The whole outfit consisting of a strip of canvas for the cot, a strip for the "lean-to," two sides, two pin posts and four tent pegs with a few feet of rope may be wrapped around the pillow and blankets and strapped to the running board. Around the bundle should be wrapped a piece of automobile topping material, water proof. This piece of rubberized fabric should be about three times the width of the cot and slightly longer. On cold, foggy nights the fabric can be fastened around the bed and held by snaps beneath. It will be loose enough to allow one to crawl beneath the blanket, yet tight enough to protect the cot, underneath, from the weather.

As an accessory to the sleeping outfit you will need a small axe or hatchet with which to cut tent pegs when the original ones are lost.

Next to sleeping, eating follows a close second. There is one big advantage in automobile camping as compared with the old method; one can stay in the car and journey to the nearest town for meals or not, as one pleases. If it is not convenient to prepare a roadside meal, the car will provide rapid transportation as compared with "shank's mare."

Personally I would never plan to prepare my meals on the road unless all conditions were favorable. I can build a campfire as well, perhaps, as any of the amateur class, but with the present laws against roadside fires, I prefer to forego the pleasure of burned food and sooted pans. However, nothing is so conducive to enjoyment as a satisfying meal in the open. Hot coffee, steaming green corn or perhaps a fried fish or so has about 5000% more flavor than the same things prepared and served in a stuffy room. Therefore it is well to prepare for eating on the road and to depend upon hotels and restaurants only in bad weather.

A small alcohol stove is plenty large enough to cook for one person. A long time ago I found that the problem of cooking an egg and boiling coffee over one burner was easily solved. The amateur cooks the egg and then starts the coffee. When the latter is ready the former is unpalatably cold. If the process is reversed the coffee is unsatisfactory by the time the egg is cooked. Put the egg in the coffee and they both cook at the same time. This is not the only "double" cooking problem that can be solved.

The cooking utensils need consist of but a few articles. A frying pan, a coffee pot large enough to contain an ordinary tin cup and two tin dishes with removable handles are all that are necessary and if carefully selected as to size they can be nested, one inside of another, to take

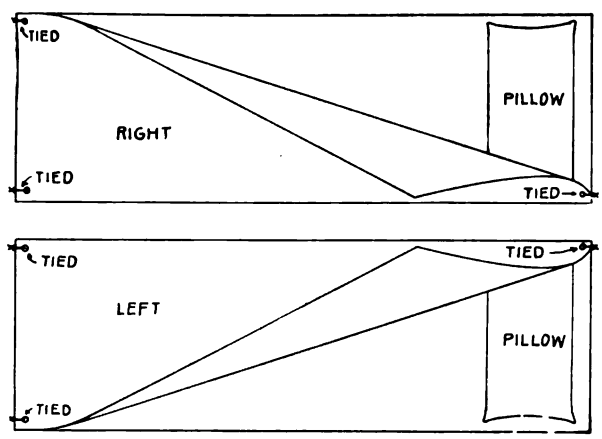

Fig. 4; The Cot Bed Made Up for "Left" and "Right" Sleeping.

up but small space. These all will go inside of a "grub box" which can be placed on the back seat in place of the cushion.

The grub box which I favor is made of rolled steel plate, with three or four compartments, lined and covered outside with white enamel. When I bought mine I asked for a "portable ice box" and that is what I got, but it cannot be excelled as a plain, ordinary, every-day, homely "grub" box. It measures 15 inches in width and depth and 30 in length. The ice partition is about ten inches in width from one end and does not extend to the top but has a cover over it which forms a box like compart-

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ment about 9 inches deep. Into the top, over the ice receptacle, is fitted a box for holding knives, forks and spoons.

While touring, the ice box, if you want to call it by this name, holds the cooking utensils, in the ice compartment and the food in the other compartment.

One should not attempt to carry much food on a tour nor should one plan to do any baking. Bakery stuff is too easily obtained to warrant any amount of roadside drudgery. If a hale and hearty man can manage to make a midnight meal, at home, from crackers, home-brew and cheese and still manage to live through the night, that same man can afford to chance what he can obtain, in the way of eatables, on the road.

It is all very well for you to read in your guide books and smack your lips over a paragraph like the following:

"Nothing tastes better to the hungry camper, early in the fresh morning air, than the common, old-fashioned 'Johnny cake,' and nothing is easier to prepare. Mix a cup of flour, a pinch of salt and a spoonful of butter up into a fairly thick batter. Prepare a bed of hot coals and place your skillet or frying pan over it. Place a small amount of batter on the hot frying pan and within a few brief moments you have a cake that is fit for a king," golden brown on the outside, crisp and flaky inside and as nourishing as any food can be."

Oh my gosh! every time I read such a bunch of drivel about the golden brown outside and the crispness of the mess of flour and water I shudder to think of my many attempts, in the open air, to prepare such a breakfast. "Fit for a King" it says! What they mean is that the mess you may prepare is fit for kaiser William, or Henry the eighth or King Bluebeard.

You can't expect to have a pleasurable auto tour, miles away from your family doctor if you attempt to eat a dried hunk of flour, squashed between two case hardened plates of soot.

Be careful of what you eat, on your trip. You won't need as much, insofar as quality goes, as you do at home. You will eat more, but be sure that what you eat is properly prepared.

Drinking water is often the inglorious downfall of a happy tour. You can write "finis" to the account of your trip more plainly with drinking water than with ink.

Often, a pretty, bubbling spring by the side of the road is as dangerous to health and happiness as a bomb of TNT wrapped up in crepe paper and tied up with a silk ribbon. The efficient, yellow-tailed wasp, who can sit down upon your nose so heavily that he will rock you to your foundations, is a slacker as compared with water when it comes to marring your pleasure.

It were better for you to drink the distilled water which you buy for your battery than to chance the wayside brook or spring. When you want water to drink, visit the nearest farm-house and if the people there seem to be hale and hearty you might also take a chance at the drinking water they use. It is the only safe bet and even then you may be taking a long chance.

As part of the camping equipment you should carry a gallon jug and keep it filled with fresh water for drinking purposes. I'm not going to say another thing about equipment. Carry the things which I have mentioned and you will live happily through the two weeks or more, provided you have some surplus currency in your pocket.

Eat only food properly prepared, drink only pure water and sleep in the fresh air and your vacation will be well spent.

YOU CAN—

—Camp in the woods, but the bugs and mosquitoes will be your companions.

—Carry your best clothes and your dress suit, but you don't need them.

—Eat and sleep in hotels, but you won't have the fun of auto-camping.

YOU CANNOT—

—Change your diet too greatly and enjoy your camping trip.

—Expect to keep well if you drink from the brook or the wayside spring.

—Have a good time if you don't eat well and sleep sufficiently.

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Babbitting Connecting Rod

The Entire Job Fully Described and Illustrated

By David Baxter

WE HAVE discussed the re-babbitting of the crankcase half of a Ford cylinder block in a previous issue, so it may not be inappropriate to cover the babbitting of a connecting rod, this month, since the connecting rod is the next thing to a crankshaft.

The devices employed in this work are few and the process is quite simple, although these things vary somewhat in different shops. However, the theory is practically the same, whatever be the method or devices.

The mechanic may use home made contrivances or he may purchase a factory-made babbitting outfit. Or combine the two and pattern the former after the latter. This is probably the best suited to all shop conditions, since the mechanic must consider the different shapes and sizes of the various styles of connecting rods, especially if he is doing a general repair business and not specializing on one particular car, for the devices employed on one connecting rod job will not always fit another of a different make. But it is well to have a babbitting device for each of the several kinds of automobiles which are the most numerous in his locality. It will at least save a great deal of time, which is a prime factor nowadays.

The Babbitting Jig

The device is what is termed a "babbitting jig" and is easily constructed in any machine shop. A metal spool is turned out on a lathe in about the shape indicated in the photos which accompany this discussion. This spool is easily made from a piece of shafting. Between flanges it is turned to fit exactly the particular connecting rod bearing in which it is to be used. The body of the spool should be machined to the size of the bearing it is to form. That is, it should be the size of the crank pin the bearing it is to fit; the corners next the flanges should be squared or rounded according to the desired shape of the babbitt bearing. The whole thing should be polished smooth before it leaves the lathe.

Spacing Slots

After machining the center part of the spool, the next thing is to cut spacing slots. A hack saw is used to cut a narrow slot in one side of both flanges. These slots should be directly in line from end to end of the spool. They should also be cut at exact right angles with the center of the spool diameter. The metal is sawed out the full depth of the flanges; or until the hack saw blade rests squarely along the body of the spool. Then a spot on each spool flange directly opposite the slots is located, or in other words, an imaginary line would cut the spool in halves on the end.

Slots are then sawed in each flange exactly like the first two slots, being particular about the alignment in regard to the first slots, and to the body of the spool. These slots are for the purpose of dividing the spool in halves so that both bearings can be babbitted at one time.

That is, the cap and the rod bearings can be babbitted at one and the same time. This is achieved by slipping two pieces of tin in the slots, as is shown in one of the pictures. Not only does this arrangement permit casting both bearings at one time but it also spaces them so that each bearing is the proper thickness. That is, the molten

Fig. 1. The babbitting jig.

babbitt when poured will run the right thickness around the spool.

After the spacer slots are located and cut, a pouring groove is next made in both sides of one flange. This pouring groove is clearly shown in the picture where the mechanic is indicating the inserting of both pieces of tin in the sawed slots. It consists of a filed groove about half way between the tins. The pouring groove for the other half of the bearing is located on the other edge of the same flange. Molten babbitt is poured through these grooves into the bearings.

This spool and the strips of tin form what is called

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the "babbitting jig." It is placed between the cap and connecting rod bearings while holes are located in the pieces of tin through which the bearing bolts may be inserted when the babbitting is to be done. After the holes are cut in the tins they are again placed in the spool slots and fitted in place on the connecting rod. Then the cap is bolted on and the bearings are ready for casting.

The next essential part of this semi-home-made process is a quantity of moist earth for banking around the jig while the metal is being poured. This earth is much more satisfactory than fire clay or babbitting putty. Ordinary garden soil is very well but if the mechanic has access to a foundry it is better to obtain a bucketful of molding sand; this will last for years if care is taken to preserve it. The sand or earth is moistened enough so that it will cling in a ball when squeezed with the hand, but is not moistened sufficiently to make it muddy. It should be moist enough to hang together well and still crumble easily.

The details of this process, employing the devices described above, are as follows: First, the worn babbitt is removed from the connecting rod and its cap. This is often done with a hammer and chisel but is very easily accomplished with a blow torch or a welding torch flame. The babbitt is melted out more readily than it can be cut out; and the mechanic does not have to bother about drilling out the babbitt anchor holes. A ladle shoulde be held below each bearing to catch the melting babbitt and prevent it from being wasted.

Besides being handier a flame also serves to clean and dry the rod metal after the babbitt is removed and this is an essential part of the babbitting process. The bearings must be dry, as the molten babbitt will be blown back out if it is poured into a wet bearing. It is also a good idea to have the connecting rod warm before pouring the babbitt, especially in winter.

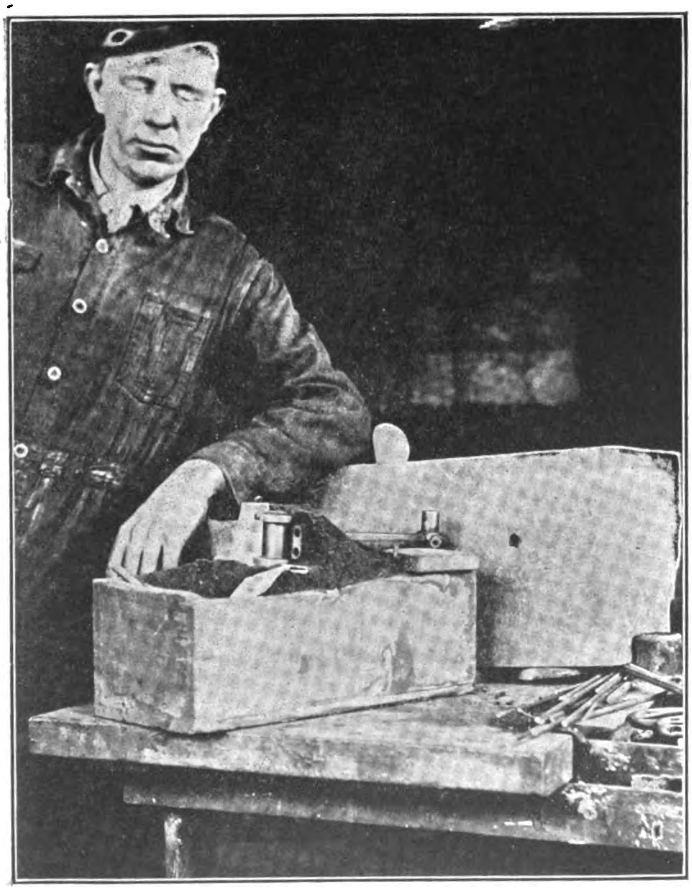

Fig. 2. Illustrating the Use of the Molding Sand.

After removing the old worn babbitt and drying the bearings, the jig is fitted and the cap bolted on. Then the whole arrangement is bedded level upon the box of moist earth. The earth is then banked up around the jig as shown in Fig. 3. This banking is for the purpose of preventing the fluid babbitt from leaking. When banking up the dirt the mechanic is careful to keep any of it from rolling into the pouring grooves; it is pressed back from these with the thumb and forefinger. The banking should be firmly pressed around the jig as there is considerable pressure when the metal is poured.

Melting the Babbitt

The next thing to do is to melt the babbitt. This is usually carelessly or at least indifferently done in many shops. But the results obtained by being careful and systematic are well worth the effort. However, very few shops are equipped with modern appliances so we must substitute "home remedies." In the first place the babbitt should not be over-melted, or too hot when poured. Nor, on the other hand, should it be poured sluggish or too cold. If it is overheated its nature is changed or its quality altered; it is burned or oxidized; excessive dross forms on the surface of the molten metal. If it is not hot enough, the molten babbitt will not run well but will leave seams or mis-run places in the bearing; often holes or open portions. Then too, sluggish babbitt traps impurities beneath the surface, which would rise if more fluid metal were used.

There are several tests by which the pouring temperature may be estimated quite accurately in absence of heat measuring devices. One is to plunge a splinter of soft white pine into the melted babbitt. If it ignites, the metal is too hot and should be allowed to cool perceptibly before pouring. If the pine chars badly although it does not blaze, the metal is still too hot. Saw dust may be used in place of the splinter by sprinkling a pinch of it upon the molten surface, or the metal may be tested by bits of news paper in the same way.

Melt Over Slow Fire

The babbitt should be melted over a slow fire because the danger of over-heating is then minimized. Borings, filings, and scrap metal should be melted first and then the new or ingot metal added to the molten bath. This does not take so long because the borings touch the ladle in all parts. Therefore they melt quicker, and when the ingots are placed in the molten pool they are heated on all sides at once, which makes them melt more quickly. After the ladle is filled with melted babbitt the heat tests are applied.

A bit of resin dropped into a ladle of molten babbitt is said to improve its running qualities and make a more solid bearing. Some mechanics advocate the placing of

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this resin before the ladle is heated. But it would seem that nothing like this is needed if the babbitt is of good quality in the first place and is melted carefully.

Probably the simplest way to tell whether the babbitt is hot enough to pour well is by rocking the ladle and watching the surface of the molten bath. But this can

Fig. 3. The babbitting arrrangement ready for pouring the metal.

be truly learned by experienced observation only. If the surface ripples somewhat like water it is too hot yet. When it rolls more slowly it is about right for pouring.

When the metal is ready to pour the surface impurities or dross should be carefully skimmed. This is handily accomplished with a flat spoon-like tool, made by hammering a couple of inches of a half inch round bar of iron flat and thin. The dross is lifted off and deposited in a special receptacle if it is the shop practice to save the stuff. At any rate the mechanic should be careful not to spill any of it in the fire if the melting is being done on a blacksmith forge, as it will spoil the fire for welding.

The babbitt should be poured as soon as it is in the right condition. And, it is not amiss to state here that the babbitt should be melted and poured soon after the jig arrangement is ready, since the moist earth banking tends to cause moisture to gather on the spool and tin shims. At least the device should not stand long before it is poured. The molten metal is poured quickly and deftly into one pouring groove and then the other without delay. This prevents gas or condensation from formin the second half of the bearing. The grooves may be filled entirely full as they are easily cut off after the metal cools.

When the metal has set thoroughly the moist earth is scraped aside and the connecting rod taken out. The dirt is all replaced in the box to keep for future operations. It will keep indefinitely and has only to be moistened a little if it becomes dry before using again. It is handy also for making ingot molds into which to pour the excess of melted babbitt. The earth is leveled in the box and has troughs pressed in it into which the extra babbitt is poured.

The strips of tin are removed first or afterward according to which is the most convenient. Both new bearings are then ready for polishing or dressing otherwise. The pool and the tin dividers are then coated with oil to prevent rusting, in the event that they do not happen to be needed again for several days.

The new bearings are then dressed by scraping rough spots and sharp corners. Oil grooves and holes are then made when the bearings are accurately fitted to the crank pins or to the piston pins as the case may be.

FINER POINTS OF DRIVING

H. S. Trecartin

IT IS the custom of a good many automobile drivers when going down a slight hill to throw the clutch out and hold it out, thus letting the car coast down the hill disconnected from the engine. In many cars this is a harmful practice because the thrust collar, which disengages the clutch, has not been designed for this kind of usage. It is liable to become dry and squeaky or to wear out rapidly if used in this way.

When the car is standing still and the clutch is disengaged, the clutch ceases to revolve, and there is no wear on the bearing. This is true whether the gears are in mesh or not. When, however, the car is moving and "in gear" the clutch is being driven by the rear wheels and a considerable force on the clutch thrust collar, or yoke, is necessary to hold the clutch out of engagement, which places a high initial pressure on the bearing.

When coasting down a long and very steep hill it is possibly desirable to keep the car in gear and to somewhat relieve the brakes' duty by closing the throttle of the engine and letting this drag help to hold back the car. It is often pleasurable, however, when going down a long straight hill to allow the car to coast without the engine. The utter absence of noise attained in this way is quite delightful. There is one proper way to do this. The gear shift lever should be thrown into the neutral position. The engine may be throttled down or switched off entirely. When nearly at the bottom of the hill the motor should be started and accelerated by opening the throttle, then without touching the clutch the gear shift lever can be gently slipped into high gear without any perceptible jar or noise. This is a little refinement in driving worth mastering which is probably not known to twenty per cent of the drivers on the road.

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Resurrecting An Automobile

Part Six

By James F. Hobart

"WHEN I got this car," said Mr. Simon Smith, "I waited three days for it while the storage battery was being charged. After two days charging, they reported that one cell had not 'come up' properly and when they brought the affair back, they said that one cell would not test up."

Mr. Smith sent away and obtained a dinky little hydrometer in a glass tube with a rubber bulb attached. With this he sucked some electrolyte from the first cell and found it registered 1200. The second cell showed only 1175 and the third cell gave 1225. The fluid level was very low in the middle cell, barely over the plates and about a half inch below the proper line in the other cells as shown by a picture in the instruction book. Simon filled all three cells with distilled water using the hydrometer bulb as a filling device.

Two days afterward, the car having made about 100 miles, Mr. Smith found the water level down again in the middle cell. No leakage was observed under the storage battery, but the liquid level simply *would not* keep up in that middle cell. Still, the ignition worked all

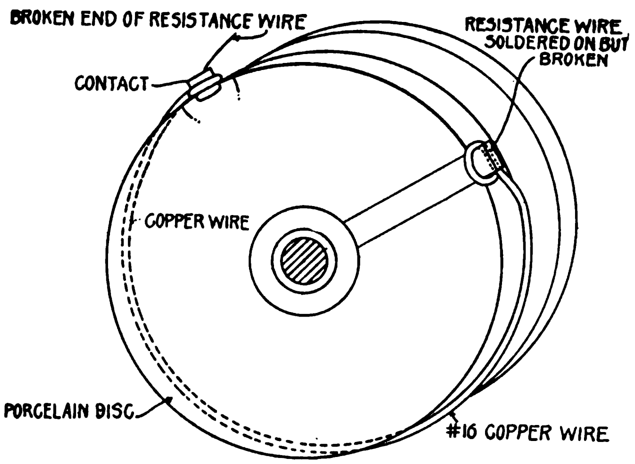

Fig. 1. How the Resistance Unit Was Repaired with Heavy Copper Wire

right, the self-starter cranked the car and the lights did not "go down" much when the starter was put on. Every three or four days, Simon filled that middle cell which never showed more than 1150. He sent for estimates on the price of a new storage battery but still the old one did its duty.

"I'm just going to see how long that old battery will work" said Mr. Smith, and as I am writing this story, five months after Mr. Smith bought the car, the battery is apparently doing duty as well as ever but with very much less loss of liquid from the middle cell, which still leaks some. But one day Mr. Smith became painfully convinced that the battery *did* leak. He had procured from Chicago a "cover-all" suit, made in one piece and enveloped in that, Simon had crawled under the car from the left hand side. He found very little room under the battery and in moving around, brushed his chin against the bottom of the battery box.

Some moist dust come off the box and adhered to Mr. Smith's face and in a very few seconds, began to tingle and bite in earnest. Mr. Smith "tumbled" to the fact that he had got vitrol on his face which was becoming decidedly painful and with one squirm and a wriggle, he was out from under that car and on a dead run for the house. He did not stop to go in. Under the eaves was a washtub nearly full of rain water and into this, went Mr. Smith's face—pronto!

The dust and sulphuric acid was at once washed off and the "biting" ceased. Later, Mr. Smith found that he had taken the best possible course with the acid, that is, the application of a very large quantity of water. An attempt to remove the acid solution with a damp cloth—a little water—would probably have resulted in severe burns and perhaps a malignant sore on his face for acid ulcers are often very hard to heal.

Clothing and Battery-Fluid

In a case like this it is also good to apply soda or some other alkali to the skin after the "dip" to neutralize whatever acid may remain in the pores. After this a little vaseline may be applied and there will be no ill effects from the accident; provided the acid be washed off as above AT ONCE.

If the acid cannot be instantly washed off with lots of water, then wipe off the acid as quickly as possible and apply to the flesh some alkali which will neutralize the acid. Soda, lime, ashes, soap, ammonia, etc., will all help matters but nothing will do as well as plenty of cold water applied *at once*. Through the above incident, Mr. Smith found that the electrolyte was really leaking through the bottom of the battery box and being absorbed or wiped off by the road dust which drove against the under side of the car.

Mr. Smith soon learned another eight-dollar lesson regarding storage-battery electrolyte. He was testing the fluid and handled the hydrometer a bit carelessly—although he did not know it at the time—and some of the liquid flew off the tube which was dipped into the battery-fluid. Two days afterwards, Mr. Smith found that his Palm Beach trousers showed a new effect. Whereever the acid had fallen from the hydrometer tube upon the cloth, the acid had eaten out the woolen fiber and left the cotton intact. Mr. Smith didn't like his polka-dot

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trousers but he was mighty careful with the hydrometer, after that!

A Shaft for the Speedometer

Both the drive gear and the flexible shaft were missing from the speedometer when Simon bought the car but he was informed by the dealer that the chain was in a garage in Clearwater and the gear in another shop in Tampa, where the parts in question had been removed during repairs to the car but had not been replaced thereupon. Mr. Smith said considerable about getting hold of the missing parts but the dealer talked so beautifully about locating the gear and shaft that Mr. Smith waited patiently for them while the dealer forgot all about the matter before he had fairly closed his mouth after making the nice promises.

One day early in January, while in St. Petersburg, Mr. Smith called at a garage which specialized in Cadillac supplies and orderd two keys to replace those for the ignition lock which were lost by the former owner of the car. Mr. Smith also ordered two resistance units for the timer. He also asked the supply concern to obtain estimates on cost of a new shaft and gear for the speedometer. At this writing Mr. Smith is still waiting for the keys, for the timer resistance units and has given up all hope of ever obtaining a speedometer shaft and gear from the parties in question.

"I reckon," said Mr. Smith, "That I will have to do as Dad told me when a boy at home on the farm. Then, whenever I asked Dad for anything, from a pair of shoes to a new buggy or a cabinet organ, the Old Gentleman would say:

"There is the shop, the tools and the stock. If you want anything, MAKE IT." And I did—or went without!" Mr. Smith is still locking his car with a chain and padlock. The good looking speedometer doesn't register and the resistance unit still has a piece of No. 16 copper wire twisted around it in place of the conventional resistance wire.

That Resistance Unit

The first Mr. Smith ever knew about a "Resistance Unit" was one day when he had run the car into a neighboring garage for air and gas. The car simply would not start and he could not make it do so. Finally while "monkeying" around the right-hand side of the engine, looking for the cause of the trouble, he happened to find two little wire-ends sticking out into the air and leading nowhere. Naturally, and without knowing why he did so, Mr. Smith twisted the two wire ends together and went on with his hunt. Finding nothing, he tried the starter again and to his surprise and delight the car started at once and Simon drove home wondering about those two little wire-ends.

A day or two later, the car again refused to start. Mr. Smith looked at the twisted wire ends. They seemed all right and he gave them another twist with his fingers to make sure they were tight. But he had barely touched the wires before he dropped them and began to hop around with a burned thumb and forefinger. Those wires were nearly red hot! Upon investigation it was found that the twisted connection—a very poor one on account of the stiffness of the wires, had heated enough to burn the flesh severely. The connection was tightened with the pliers and the car started again.

Later, however, the car "died" right in front of a garage. Simon looked for the twisted connection and found it had disappeared. It had burned or broken away as shown by the engraving—Timer Resistance Unit—and

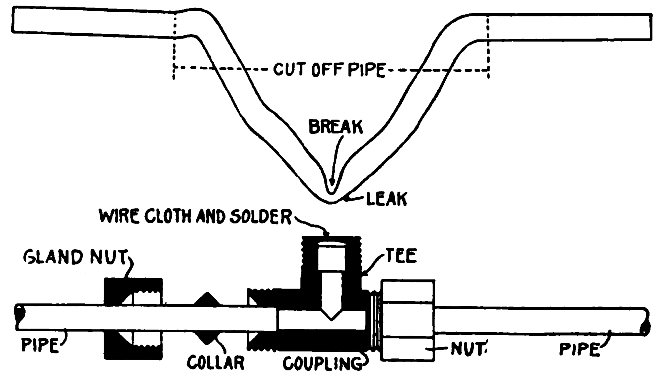

Fig. 2. Repairing the Gasoline Line

apparently there was no way of getting current to the distributor, or rather to the spark coil, which in the Cadillac car seems to be a single-spark transformer of the step-up type. Mr. Smith called upon the garage man to put in a new bit of resistance wire. The Garage man replied that he had none. Finally he was prevailed upon to put in a piece of copper wire. He had only some very stiff No. 16, which he finally managed to wind a couple of times around the porcelain disc, in the edge groove. and to make a sort of connection between the stiff wire and the two contacts. But the car started and ran all right with the 35 cents worth (?) of wire thus acquired.

Every few days, Mr. Smith is obliged to remove the resistance unit and press the copper wire more closely around the contacts. The heating and oxidization, going on all the time, made the contact so poor that current could not get through to the ignition coil without frequent tightening of the contacts where the stiff copper wire was wound around the frame connections of the unit. Mr. Smith was afraid to solder the wires lest the soft metal melt off when the wire got hot or he would break or melt off the contacts while trying to solder them. Thus, he is running all the time "between the devil and the deep sea" while waiting for the new resistance unit which never has come.

It took Mr. Smith quite a little time to figure out the reason for a resistance unit, as the car seemed to run perfectly with a plain copper wire in place of the resistance wire. Finally he got it through his head that the resistance unit was for the purpose of protecting the primary winding of the ignition coil. Usually the motor stops in a certain position, relative to its pistons, and with the timer midway between contracts, when a resistance wire in the circuit is unnecessary.

But should the motor chance to stop with one of the

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timer-contacts in position to fire one of the cylinders, then there must be an uninterrupted circuit through the primary winding of the ignition coil for the full power of the storage battery and the result would probably be the burning out of the primary coil—besides a great waste of battery power—were not the resistance wire present to cut down the amount of current which could be forced through the coil winding. In other words, in case of a standing "short" through the coil, the resistance unit would cut down the possible amperage through the coil to a figure which would be unable to overheat the winding of the coil. In running without the resistance, Mr. Smith is *"taking a chance"* that is all, and he may or may not burn out the coil.

A Gasoline Leak

"I have found," said Mr. Smith one day:—"that whenever my nose detects a strong smell of gasoline around the automobile, that it should be my business, *forthwith or sooner,* to hunt for a leak which may be robbing me of much gasoline and returning therefor nothing but danger of explosion and fire!"

One day he found a strong smell of gasoline around the car and after tracing back from carburetor a ways, found a place in the gasoline pipe which had been very badly bent and kinked to the extent of flattening the pipe out of a good deal of its capacity Furthermore, constant vibration had caused a break in the pipe as shown by the cut. Soldering the leaky place failed to stop the trouble and finally a piece of pipe was cut out as shown by the dotted lines and a bit of new pipe was soldered in, in place of the damaged piece.

The ends of the new pipe were flanged out so that the old pipe could go inside, but for all of that, the soldering did not hold. It had to be renewed several times and Mr. Smith never could depend upon the soldered joints holding the pipe tight. A few couplings were procured, a new bit of straight smooth pipe fitted, and the couplings applied as shown by one of them in the engraving. The new pipe was smooth and plain, no upsetting or enlarging at the ends, just slipped into place after having been cut off and the ends smoothed and freed from the burr of cutting.

As shown by the cut, it was impossible to obtain straight couplings and a "tee" had to be used instead. The branch was gotten rid of by soldering. First making it bright inside, then it was tinned and a circular bit of wire cloth was cut to fit into the branch, after which the wire cloth was soldered over and the opening in the branch completely closed with a thick plug of solder. The wire cloth merely served to hold the melted solder in place until cold. A bit of brass or tin would have answered as well but the wire cloth was easier formed and put in place.

The Gas Pipe Repair

The engraving shows how the gland nut was first slipped upon the old pipe, then the triangular collar slipped in place, the pipe pushed into the coupling, after which the gland-nut was screwed home tightly and the joint was found gas tight in a jiffy. This beats all the soldering and you can get these couplings apart and tighten them again whenever necessary. The triangular collar will be tightly compressed between the coupling and the nut and forced so closely against the pipe that you can never remove the collar again without being pretty certain of destroying it and damaging the pipe upon which it mav have been placed.

In tightening these couplings Mr. Smith found that it paid best to use two wrenches, one to turn the gland-nut, the other wrench to hold the coupling from turning. In the plain coupling, a place had been hex-squared for that purpose and the tee can easily be held by a monkey wrench slipped over the branch. When the coupling was held as above, the gland-nut could be screwed home without twisting or distorting the pipe or collars in the least. But when, as should not be done, a wrench is applied to either gland-nut and one is held while the other is turned, there must be more or less slip of one of the collars.

Mr. Smith found that the latter method of tightening gasoline pipe couplings was very apt to twist or distort the pipe or to score either or both the pipe or the collar until no further amount of screwing the gland-nut could make the coupling tight again. He also found it to be a very safe habit to daub the pipe, collar and gland-nut liberally with laundry soap—from a soft cake—before putting the several parts together. Soap makes almost any connection proof against gasoline leakage, therefore, use it in all connections for gasoline.

* * * * .

CONSISTENT

"How old are you?" asked the judge of a woman witness.

"Thirty," she replied.

"Thirty!" exclaimed the judge. "I've heard you give that same age in this court for three years."

"Yes," returned the witness, "I am not one of those persons who says one thing to-day and another thing tomorrow."

The more nearly square the foundations of your business, the longer it will stand up and the taller it will grow.

Study him closely and you will find that frequently the high roller has wheels in his head.

Some men will over-exert themselves to dodge their creditors and run headlong into other kinds of trouble.

The man who is opposed to the public enterprise of others is likely to find others opposed to his own private enterprises.

You have to watch your step to leave footprints in the sand of time.

Perhaps you have noted that the man who walks around asleep is not always a somnambulist.

When industry goes out of the window, poverty breaks down the door.

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Files and Filing

Concerning the Construction and Proper Usage of This Important Tool

J. F. Springer

THE FILE is a tremendously useful tool when in the hands of one who knows the possibilities and how to get them. There are at least a score of varieties in use. I reproduce from W. H. Van Dervoort cross-sections of twenty styles and the names used as designations. The names are: 1, *hand;* 2, *flat;* 3, *mill;* 4, *pillar;* 5, *warding;* 6, *square;* 7, *round;* 8, *half-round;* 9, *three-square;* 10, *knife;* 11, *pit-saw;* 12, *crossing;* 13, *tumbler;* 14, *cross-cut;* 15, *feather-edge;* 16, *cant-saw;* 17, *cant-file;* 18, *cabinet;* 19, *shoe-rasp;* 20, *rasp.*

The *cuts* on the filing surface cause working differences in the tools. There are files called *single-cut* in which the cuts all run in one and the same direction. The angle of the cuts with the length of the file varies from 65 to 85 degrees. The several varieties in this range produce files suited to a diversity of work. The *double-cut* file has cuts running in two directions. Representative files of this variety have the one direction making an angle of 40-45 degrees with the file length, and the other direction making an angle of 70-80 degrees.

There are finishing files of the double-cut type which have the one row making an angle of about 30 degrees, and the other row an angle of 80-87 degrees. The double-cut file has a large number of teeth with oval points. The *rasp* differs from the other two types in having its teeth all separate, the one from the others. These teeth are round on top. They are, or may be, formed by forcing a punch into the surface metal of the file. The rasp is not much used by machinists. It is particularly suited for use with such soft materials as wood, leather, the horny part of a horse's foot, etc. The single-cut and double-cut files are the regulation files for metal work.

The cuts differ, in that some are rough, while some are coarse, bastard, second-cut, smooth or dead-smooth. Here we have the several degrees. As a rule, the rough variety is a single-cut file, and the dead-smooth a double-cut file.

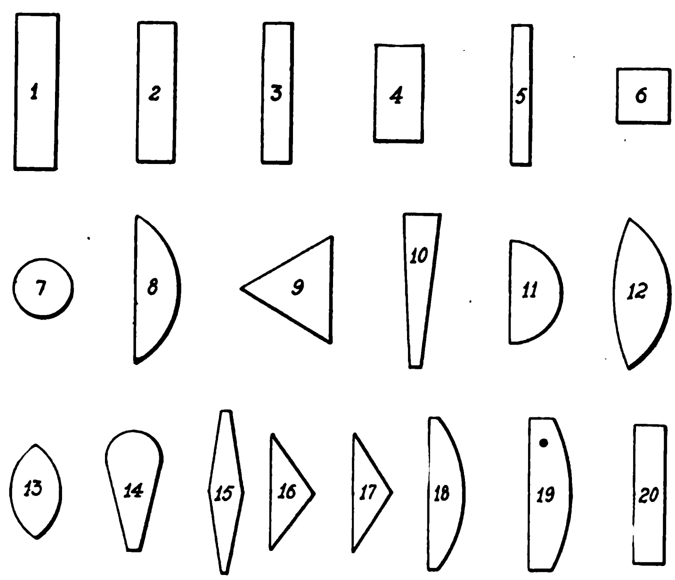
In seeking to make a choice from these grades, the reader is to bear clearly in mind that *length* plays a part. There will be, say, for a certain given length the several degrees of coarseness. Then there will be a similar condition of affairs for another length. For one single length, the degrees may be compared with each other. But the "smooth" of a short length will differ from the "smooth" of a long length.

It has been said that the value of a file turns upon three things: (1) quality of the metal, (2) form of teeth, (3) hardness. Files are now generally machine made. It used to be an objection against a machine made file that the teeth were too uniform. In the hand made article, the workman spaced the lines of cuts with some variations, even if he tried to do otherwise. This and other things produced files with a moderate degree of variation in the teeth; and this variation was desirable in order to get the file to take hold. At present the best machine-made files produce variations by pre-determined designs.

What is wanted in a file is not that all the teeth shall work, but that only a fraction shall work at any given time. Then it is possible to get the file to take hold without exerting much pressure. And this elimination of strong pressure is desirable.

For *broad surfaces,* the double-cut file is to be preferred; on *narrow surfaces,* the single-cut file. It seems that in every narrow work, the single-cut file has the advantage because one then gets the benefit of its long teeth which follow in one another's track, the result being a smoother one.

One notices that files are not always of the same thickness from point (tip) to heel (rear end). The tool is said to be simply "tapered" when the point is thinner



Various Shapes of Files As Described in the Text

than the middle, and "full-tapered" when the middle is thicker than *both* point and heel.

The tapering of files is done with one or more purposes in view. In the first place, the tapering produces a slight convexity, so that when the file is used on a flat surface a less number of teeth will come into actual contact with the work. This is often desirable. Second,

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the perfectly flat file is difficult to use for the purpose of making a perfectly flat surface. In fact, it tends to round the work next the operator and on the far side. By moving the tapered file all the way from the near edge of the work to the far edge of the work, flat surfaces may be produced.

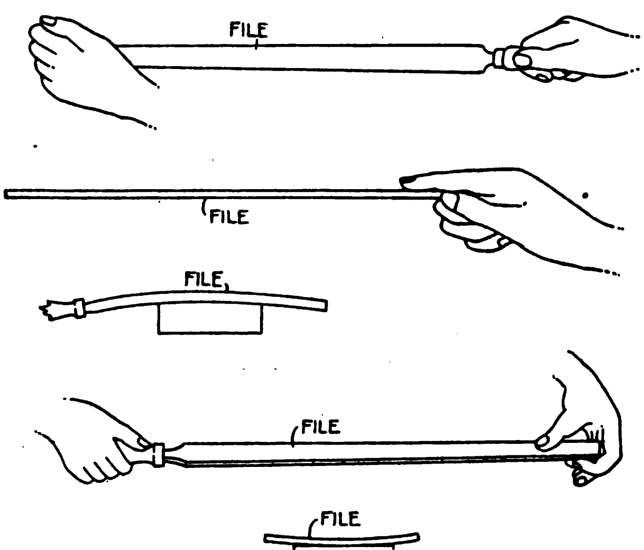
The file itself will often be imperfect in form because of the unequal effects of hardening. Thus, in the case of the tapered file, the hardening may exaggerate the convexity on one side at the expense of the other. Such a file is said to have more "belly" on the former side. The expert workman will usually select this side and the most prominent region of the side and use it on the most particular work.

Cast Iron and Brass

Cast iron and brass require greater sharpness in a file than do steel and wrought iron. Consequently, new files may preferably be used on cast iron and brass, and later on wrought iron and steel.

Holding the File

When the work is to be filed by shifting the file endwise across the job, it will be well to use both hands provided the work is of such a character as to require



How a File May Be Distorted by Improper Pressure, Below and the Proper Way to Hold It, Above

a heavy file. A right hand workman holds the handle in his right hand, the end of the handle abutting against the palm. The left hand holds the point of the file. A very severe grip is ordinarily not required.

But if the work demands a light file, the workman may hold the file in the right hand with the fore-finger extended along the top and with the thumb resting against the side just forward of the handle. The fore-finger may be used to exert a substantial amount of pressure.

Sometimes the file will not have much "belly" and will not be heavy enough to be stiff. Under such circumstances, unless care is exercised, the use of two hands may cause the file to bend in such a way as to be concave underneath. This is a very objectionable thing, as the file will then tend to cut away too much metal along the near and far sides of the work.

To meet the difficulty of a bending file, one may use his two hands in such a way as to cause the file to bend up at point and heel and down at the center. This tends to produce a convexity next to the work. However, if the work lasts awhile and considerable pressure is required, the workman may find himself getting tired. He may then let the file run straight—that is bent neither to produce a convexity nor a concavity. By alternating the two methods of holding, the work becomes less tiresome.

The Handle

One should not neglect the handle. If it is of soft wood, the tang of the file may be driven into a hole slightly smaller than itself. If however, the wood is hard, the tang may be heated to a red heat and a hole burnt into an exact fit. In order to prevent drawing the hardness of the file teeth at the heel, one may wrap this part of the file with a piece of wet cotton waste.

Broad Work

Sometimes the work is so broad that the file itself is scarcely long enough and the handle strikes against the near side. A special modification of the usual handle may then be used. The illustration shows such a handle. There is a tapered dove-tailed slot in the bottom of the handle. It is proposed to fit the tang into this slot. To do so may require that the tang be filed more or less. The fit is considered important. The file is shoved and withdrawn by the right hand grasping the handle. The left hand has its fingers resting lightly on the far end of the file.

There is an alternative form of handle shown in another illustration. This style of *surface file-holder* consists of a handle similar to an ordinary file handle, of a long rod, a tang-piece, and a *center-piece.* The tang-piece is provided underneath with a tapered dove-tailed slot to receive the file tang. The last may, if necessary, be filed so as to provide an accurate fit. The center-piece is a kind of support for the rod. At the far end of the rod is a piece which is cut underneath to provide a recess into which the point may extend. The rear end of the rod is in threaded engagement with the handle. By screwing up the handle, the file may be forced to bend and become convex underneath. No part of the surface file-holder comes into contact with the work.

A great deal of work will be such as to call for more or less muscle. Under ordinary circumstances, it will be well to place the work so that the surface which is to be filed is at the level of the elbow. The arm may then swing forward and backward in a stroke of not much difficulty. However, if the work calls for a good deal of pressure, the workman should stand back a bit with one foot advanced. As he moves forward, he throws some of his weight on the file and relieves the forward foot somewhat. The rear foot, during the cutting action

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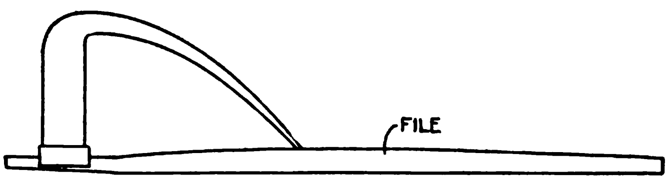
of the file, provides resistance. As the file is brought back, it is kept on the work but is not allowed to cut. The front foot again takes the weight of the body.

Fine Work

If the work is small or of a very particular character, where the eye should note continually the action of the file, the work may be secured in a more elevated position. One hand will often be all that it is necessary to use.

Removal of Considerable Metal

When a large quantity of metal has to be removed by filing back and forth over a broad surface, it is considered advisable to vary the direction of the arm-stroke. It is claimed that truer work will result from a frequent change of stroke and also that more metal will be removed. Further, it is considered preferable to avoid managing the file so that the line of the arm-stroke is in agreement with the axis of the file. There should be a marked angle between the length of the file and the line of movement across the work. The file is under better control and deep grooving is reduced.



Simple File Holder for Flat Surfacing

If the surface is narrow between the near edge and the far edge, and if in addition there is a good deal of metal to be taken off, it is permissible to vary the angle between stroke line and file axis. But, a new file should ordinarily not be used in this manner, as it cuts in too freely. This caution is especially to be remembered when using double-cut files. The teeth of such files are relatively small and are liable to damage from severe action.

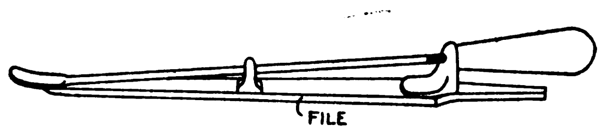
Which Files to Use

The *shape* and *size* of the file to be used will be governed by the form and position of the surface to be filed. Thus, for a plane surface, one selects the hand, flat, mill, or pillar file. This rule applies especially to exterior surfaces where there is little or no hindrance to file movement. But, if the surface to be filed is an interior one—as, for example, the faces of a mortise or keyway—then a pillar or square file will probably be more suitable. If the dimensions admit its use, the pillar file having one safety edge has been recommended as best suited for the job. An extra narrow pillar file may ordinarily be employed wherever a square file of the same length may be used.

In cases where the opening is quite narrow, a warding file may seem best adapted. This file is not tapered, but is of equal thickness from point to heel. The workman will accordingly have to provide "belly" by springing the file as he holds it.

If a square or a round hole is to be filed, as large a file as will work freely is to be selected. If the hole is quite small, a long slim file of round or square cross-section may be used. But if the hole is short relatively to the length of the file, a two-handed stroke may often be used to advantage, the one hand being placed on the point and the other on the handle. With a long hole, two hands may often still be used, only both are used at the handle end, one hand (the left) being put on top the other.

Naturally, the curvature of the cross-section of a file must be of a smaller radius than the curvature of the cross-section of the hole. But the difference need not be much. If it is considerable, then it will be more or less difficult to keep the hole round. If the hole is of considerable size, it may be impractical or inconvenient to use a full round of the proper curvature. Such a file would nearly fill the hole and also be a big fellow. A half-round file or the like may be used. Instead of simply running the file in and out, it may be made to swing partly round the circle with each advance stroke. This is advantageous in respect to maintaining the proper curve, especially if, after a while, the swing part way round the circle is given in reverse direction. The file is to be curved a little length-wise. This brings a certain high spot into cutting action. As the file is shoved in, it should also be given a slight rotation so as to bring this high spot continually into action as the whole file is made to swing part way round the circle.



A Second Form of File Holder Which Is Very Adaptable

The Safety Edge

A safety edge is an edge without teeth. It is usually possible to grind such an edge on an ordinary file. When such a file is used in a corner, the safety edge does not cut, but an adjacent file surface may be put into action nevertheless. The safety edge is useful, for one thing, in work where a sharp interior corner has to be cut. A file surface adjacent to the safety edge can be used on one face of the corner without fear of injuring the other face where the safety edge is in contact.

Ordinary files of rectangular cross-section are more or less rounded on the corners or have inadequate teeth at these locations. Consequently, they are ill-adapted to cut a sharp corner. But such a file may have one file face ground away, when a safety edge will be produced, and also teeth will be secured right at the corner.

The world may be round on payday, but to some it seems rather flat the rest of the week.

Success comes to the man who does not fear failure.

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Automobile Dealer and Repairer

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The Same Old Subject

WE HAVE harped so often on the subject of automobile accidents that it would seem there wasn't much left to be said; however our judgment tells us that this is one subject which is like the latest rural motor 'bus, always room for something more.

By way of introduction to our subject we might relate a story, which though somewhat aged and wrinkled, is entirely appropriate.

An old automobile salesman was demonstrating his latest model de-luxe, fresh from the Ford factory when he suddenly applied both brakes so rapidly that the occupant of the other front seat was forced to brace himself against the wind-shield. The reason for this sudden and effective stop was the passage of a large motor truck directly in front of the flivver.

As soon as the passenger, a rather crotchety old gent', had collected his scattered senses and found his equilibrium again he remarked; "Whaddye want to stop for? Didntche see that you had the right of way?" "Sure I did," answered the driver, "I had the right of way, all right, but the other fellow had the right of weight."

The moral of this little story is plain. The driver who uses his bump of precaution before he listens to the small voice which tells him his legal status, lives to a ripe old age; whereas the fellow who insists upon his "rights" and leaves caution to the other fellow, stands a good chance of resting peacefully beneath a big white stone at an early date.

A good driver is a sane driver and not necessarily a fast one. The driver who expects every other motorist to keep out of his way may sometime meet another of his kind and when he does, the results are unsatisfactory, to say the least.

Two weeks ago, the writer witnessed a perfectly wonderful accident, at least the accident was as perfect as an accident could be; two cars tried to occupy the same spot at the same time. One of the cars was filled to overflowing with three men and several large baskets of lunch; the other car contained seven men and a proportionate amount of picnic cheer. All the men escaped unharmed, but the food products and bottles of liquid cheer were entirely demolished. The drivers of both cars claimed to have had the right of way and the writer is not in a position to dispute with either.

If you will investigate accidents of this kind you will find that in the majority of cases there is no question as to care or judgment or precaution, this doesn't seem to enter the minds of those who are responsible for the accidents; they seem only concerned with the legal phase of the matter.

Suppose you are legally correct in assuming that you can cross the street in front of a five-ton truck; are you justified in risking your life and the lives of your passengers by driving ahead of that vehicle? We do not believe that your answer will be "yes" if you consider it carefully.

If you would avoid trouble and the hospital you will use discretion rather than insist upon your legal right, when driving your car.

The Latest Automobile Law in Massachusetts

AT LEAST one state in the Union has waked up to the fact that the enaction of "constructive" automobile laws is more effective in accident prevention, than the enaction of laws which are in the—"Thou shalt not" class.

Massachusetts has just passed a law which specifies that each automobile, while operating on the public highways of the state between one hour after sunset and one hour before sunrise, must be equipped with at least two headlights and that the bulbs therein have an illuminating power of 21 candlepower. This same law specifies that the lights be equipped with suitable anti-glare devices and that the light be strong enough to illumine the road a certain distance ahead.

Heretofore the headlight laws have been uncertain and vague. They have specified certain types of lenses and mentioned the fact that the lights must be visible, to an approaching driver, for a certain distance. Under such a law a car might comply and yet be a menace to traffic.

Under present conditions it is essential that all cars be equipped the same, insofar as illumination is concerned. Headlight glare cannot be measured or controlled, it is comparative only. To a driver, whose car is equipped with poor lights, a ten candle power headlight, approaching, is glaring. Conversely, he who drives behind a 21 Candle Power headlight combination, does not consider any light of less power as glaring.

Night driving can only be made safe for all, when our automobile laws are consistent and when they are enforced to such an extent that every car is equipped with an equal illuminating power.

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The Why of Lubricating Oil

A Lucid, Non-Technical Exposition of the Qualities of Lubricating Oil

By Ellis H. Custer

THE operation and life of an engine is dependent upon proper lubrication. Many an operator who has put in a high quality commercial lubricant, until the engine begins to smoke, if he happens to have been deprived of the services of his oil gage or for some other reason has none, wonders why carbonization develops from the best oil he has been able to find. The necessity of having good oil is widely known among motorists, although they may not always be thoroughly booked up on why it is so, and thus it is well for the garageman to be able to tell them.

A brief and easily understood statement of the purpose of lubrication is this: It substitutes for the destructive friction of metal on metal the less destructive friction of metal on oil. The liquid used in lubricating also has a certain value as a cooling agent for the carrying off or absorbing of the heat created when metal rubs on metal.

Definition of Action

A brief statement of the action of oil used as a lubricant and equally as easy to understand, is that it moves on its own particles with a sliding and slipping facility that is not characteristic of all fluids. Besides, oil is a fluid that possesses an adhesive property which is in action at the same time that it performs the functions referred to in the preceding sentence. Thus, oils, having the faculty of a motion of their own particles—a rolling up motion, so to speak,—lessen the friction of metal on metal to such an extent that they are used as a preventative of friction. While there is a common idea that oil placed on a journal or in a bearing forms a film over the contacting surfaces that prevents friction 100 per cent, it only takes a moment's thought to see that this is ridiculous.

If it were so, journals and bearings would never run hot; and if it were merely natural evaporation, or the escape of oil by gravity from its working receptacle, re-oiling would seldom be necessary. A liquid film is formed at the points of contact, but it is the friction that goes on in both substances, even with oil against metal, that "eats it up." and makes frequent replenishment of lubrication substance necessary.

Viscosity, or the fluid movement of oil on its own atoms or particles, is a property which is possessed by all liquids and which is possessed by them in varying degrees. Sometimes the property is called "body," "thickness" or even "weight." These terms are sufficiently exact as information that there is a special property in the oil that performs a special function, but they are very loosely descriptive of what that property really is. Other ways of stating the same thing, then, are that the viscosity of an oil is the measure of its internal friction, its resistance to flow, or the joint effect of its properties of cohesion and adhesion—"cohering" meaning when its particles stick to one another and "adhering" meaning when the mass sticks to the metal surface.

In selecting an oil for any specific purpose—our own case is the automobile engine—there are certain fundamental requirements which must be met regardless of those directly concerned with bearing friction. For example, in oil to be used by motorists on the power plant of their cars, a low carbon residue is a special essential. As far as the ordinary fundamentals are concerned for the obtaining of a good oil film for the lessening of destructive friction and away from the heat generated in a combustion engine, the value of an oil is almost universally deduced from its viscosity. This would indicate that the best oil to use is one that is least viscous (thick, cohesive) which will prevent actual contact of the metals.

One good proof of this is found by examining what Uncle Sam buys. Uncle Sam makes it a point to reject motor oils in case hard carbon forms in service. Is it not fair to assume, therefore, that with a fair amount of business sense and efficiency the Government will buy the best product that will do that which is to be done? Except for this carbon residue feature, viscosity is the only one of all the normal physical properties of oil which has any direct bearing on its lubricating qualities. In viscosity tests, that oil showing the least temperature rise when tested for friction, due to the frictional heat of a bearing, is considered the best oil.

Government Specifications

The Government specifications for motor oils issued by the War Department in 1920 (form 3502-F) refers to three grades of motor oils for internal combustion engines other than airplane and motorcycle types, which by a process of elimination indicates that the supplies were directed to automobiles and motor trucks more or less exclusively.

We quote from these specifications as follows:

	Light	Medium	Heavy
Viscosity at 100 deg.	175-210 sec.	275-310 sec.	475-510 sec.
Viscosity at 200 deg.	40-47 sec.	45-54 sec.	55-68 sec.
Flash-minium	325 deg. F.	335 deg. F.	350 deg. F.
Fire-minium	370 deg.	385 deg.	400 deg.
Carbon residue	0.3%	0.5%	0.7%

(Hard carbon residue in service will be cause for rejection.)

An examination of these specifications shows among other things that about equal emphasis is laid on viscosity

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and freedom from carbon residue. It also shows that the others are largely determinations of maximum or minimum values insuring that oils be safe to use without undue loss from decomposition and without causing detrimental compounds that would cause trouble in use.

The Fallacy of the Flash Point

The flash point of 325 degrees on a light motor oil is sufficiently high for the intended use of the oil. The fire point strikes many as superfluous for the reason that fire is entirely dependent on the flash in petroleum products of this sort. It may be emphatically stated that in the case of lubricating oils, flash and fire points have practically no value in indicating lubricating qualities. Perhaps it would not need to be stated at all were it not for the fact that many erroneous ideas concerning the flash point of lubricating oil have had to be combatted in the motor trade, the most preposterous of them being that the flash point was the temperature at which oil would ignite spontaneously.

A little examination of fundamentals will suffice to clear up this point. Practically all substances with which we are familiar, occurring in Nature in one of the three states in which all matter is classified, viz., solid, liquid or gas, may under certain circumstances be transformed from one state to another. The circumstances necessary are favorable conditions of temperature, pressure, etc. A substance may be changed from a solid to a liquid and thence to a vapor. In most instances, too, it may be completely reversed.

Transformation of Oil

The transformations of oil in the automobile engine, following these laws, are of two kinds. One is into vapor under certain conditions of heat alone and the other is into a solid—carbon—by the combination of heat and distillation. When oil is heated it will give off vapor, the amount of heat necessary to bring this about being influenced largely by the nature or mass of the oil itself. This vapor, or gas, is inflammable.

It is further to be said that not all substances yield an inflammable gas when heated to the vaporizing point. This yield is, however, characteristic of oils and allied substances. Consequently the temperature in which an oil, upon heating, in the presence of air develops vapor, which, upon the application of a spark or small flame, will ignite or flash is called the flash point. Now when the heating is continued above the flash point a temperature is reached where the vapors are thrown off the surface of the oil in such quantity as to ignite and burn continuously. The recorded temperature at which this occurs is called the fire point.

All this might appear to be beside the point were it not for the proneness of some people to attribute to lubricating oils of a relatively high flash point better lubricating qualities than oils of lower flash point. It needs but to be recalled that the Bureau of Mines states, "Flash point is not an indication of the value of an oil for any particular purpose. It is an indication only of the temperature at which it gives off vapors in such proportion that they form an inflammable mixture with air."

The fallacy of the flash point being the point of spontaneous combustion is easily seen. It only serves as a physical index of the change from one class of matter to another, in this case from liquid to vapor. The flash point is not a measure of lubricating qualities. Therefore it would be a question remote from lubrication, to the motorist at least, were it not for the fact that the evils of carbonization develop with the degree of flashpoint.

Oil Decomposes Under Heat

Oil when subjected to heat, especially hot air, gradually decomposes into volatile compounds and carbon. The extent of this decomposition depends on the temperature and length of time the oil is exposed to the heat. There is both a vaporization and a breaking down of the oil particles by distillation going on at the same time, especially if the cylinder walls are cooled by water jacketing. The reason for it is this: The temperature of the oil next to the wall is practically little above that of the wall. Consequently the oil layer exposed to the heated air becomes much hotter than the rest of the oil body and will vaporize. But as oils are composite mixtures, different parts distilling at different temperatures, the lighter parts will distil first, leaving the heavy ones dissolved in the oil next to the wall.

This causes the building up of a gummy mass that, on account of low vapor pressure and high distillation point, especially in cases of high flash oils with high viscosities, is not taken up by the air as fast as is necessary. In this condition of slow distillation, or if the quantity is large, the oil is subjected to breaking down operations during a longer period and more carbon is formed. The only requirement for a lubricating oil, on the one hand, from the standpoint of flash, is that it be sufficiently above the average working temperature to give a proper margin of safety. On the other hand the oils of higher flashpoint are shown by scientific deduction and practice to be contributory to the formation of carbon in an undesirable way and quantity.

Compounded Oils

Compounded oils are also contributory to the depositing of carbon. They are excluded from the general consideration of a good lubricant for the automobile, for the fixed oils and fats do not distill when exposed to high temperatures. Instead they decompose, forming a gummy and particularly objectionable form of carbon which adheres to the valves and exhaust passages.

Hard carbon, while it may not be always the cause of explosions, as some claim, is always a nuisance. Many times it accumulates on the valves and valve seats and is packed firmly into the ends of the cylinders, causing the valves to leak and frequently resulting in the cutting of the valves an dthe scoring of the cylinders. Carbon collected in the valve passages interferes with the valve openings, and when once started this carbon continues to

(Continued on page 61)

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Ford-ing the Southern Tier

A Number of Useful Hints and Suggestions Picked Up on a Trip Through This Section

By Donald A. Hampson

THE name "Southern Tier" has long been applied to that group of counties along New York State's Pennsylvania border line. There are some splendid roads through that three hundred mile stretch, which rounds out into four hundred when the Jersey border is included. Fords are thick on these roads. If a person wants to tour the State, there is no better way than to include the Southern Tier route, either going or coming, between New York and Buffalo.

Crossing into New Jersey and cutting across to Suffern, State Highway No. 4 meets one and carries the motorist through the most beautiful scenery, around and over the mountains, into Binghamton. Just outside of this city are the great Endicott-Johnson factories, guided by the man who is known as "the Ford of the shoe world." The country beyond Binghamton is flat and fertile and takes its physical characteristics from the effects of glaciers which covered that section many ages ago.

During the war, this was a favorite route for cars run east from the Detroit factories under their own power, and for the thousands of heavily laden trucks that aided the railroads in the time of stress; the route became known as the "Liberty Highway" partly because liberty was a popular word just then and partly because it passes through the village of Liberty, famous for its healthfulness and hospitality to the tourist.

City or country, the route is dotted with garages, many of them of the converted barn or overnight shed variety. In too many cases, the mechanic or owner is getting his experience at the expense of the innocent public. Often the public pays dearly, with a bonus on top of that. We got gas at one of these little places: a cloud of blue smoke was coming out of the door and a man inside raised his head from around the engine of the Ford at our call; there was but that one car in the place for the simple reason that it would accommodate no more. This man apologized for not hearing us stop—"The boss said I had to keep busy on this car until another one came in, so I've been experimentin' on my own hook, mixin' engine oil in the gasoline tank."

A friend who was driving with us at night mentioned a little trick that he had done with his flivver to aid him in making the sharp turns of the hill country. He takes the headlight brackets and twists them outwardly about an eighth of an inch each. This leaves the center of the road a little darker but it broadens the illuminated section considerably, a change that helps a driver wonderfully in rounding turns where the lay of the land is unfamiliar. The center of the road will take care of itself if you can see the ditches, and every bit that the light precedes the car on a turn is of value. Headlight brackets ordinarily are parallel—a twist with a wrench will set them pointing outward.

* * *

Everybody knows how cantankerous a Ford can be when it acts up. Sometimes a careless word from the owner will give the perplexed mechanic the trouble clue he needs. "All I know about the thing is that when I stand on the running board she runs and when I get in the seat she stops," said Mr. Smith. That gave the workman his clue and, lifting up the floor boards, he could see where one of the brackets just cleared what was apparently a good solid cable but which on careful inspection proved to be broken. The inclined position of the car with a man's weight on the running board brought the cable in contact with the bracket and thus pushed together the ends of the wire inside.

* * *

It was out near Corning that we saw two garages that gave us an idea apiece. Humble little garages beside humble little homes and housing the humble little cars. One garage was nicely finished inside, concrete floor, the windows were clean, and there were shades at the windows. This latter attracted our attention. They were old roller shades—discarded as too frazzled for house use but plenty good enough to shut out or subdue the light in the garage—and it is the direct light of the sun throughout long days that deteriorates rubber and fades the coat of paint while the car owner is away at work.

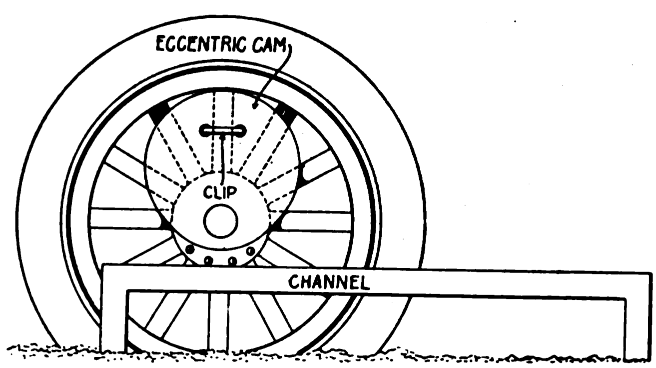

Fig. 1. The Handy Jack

The other garage was an ingenious example of cheap construction. The owner had built his frame of two by four's on his concrete foundation and framed a peak roof of the same stuff. There were no windows in the garage and the doors were of usual barn door construction yet

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when the later were closed the interior was almost as light as day, but not with direct light. "Rubberglass" is a translucent manufactured product extensively used for factory skylights; it is about the thickness of window glass but is flexible, and if washed at intervals will last fifteen years before it darkens too much for factory purposes.

The ingenious one had asked for some of this discarded material (in six foot wide strips) and had made his walls and his roof of it. The result was a near-glass house at a fraction of usual cost and a general interior effect that was both novel and pleasing.

* * *

The automobile dealers in Middletown believe in advertising as a means of stimulating business during the dull months. Going out North St., we noticed used cars in two show windows. Huge cards announced the terms on which they were offered. Copies of them are printed herewith.

* * *

Forty-five miles an hour in a Ford! "Unbelievable," you say. And yet we went up the steep three mile hill to Masten Lake at 45, while a Ford that we had picked up at the bottom stuck within twenty feet of us all the way. We laughingly stepped on her when the Ford blew

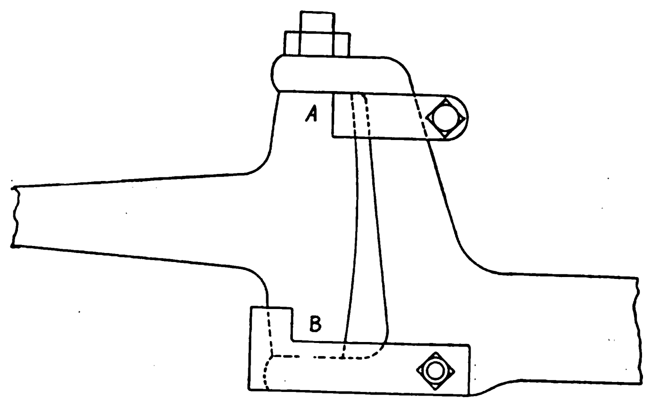

Fig. 2. Taking the Play Out of the Front Spindle

his horn behind us and promised (to ourselves) that our Lexington would shake off the Henry at the first steep pitch. At the top we slowed down to allow the challenger to pass so we could see if it really *was* a Ford. Sure enough, our lights showed the unmistakable rear end as he faded away in the darkness. Afterwards, it was learned that this was one of those sixteen valve, valve-in-head type conversions with a special high gear. So when a Ford wants to pass, let 'em go, or the laugh may be on you.

* * *

Open winters play more havoc with unimproved roads than do winters of the blizzard type—and the one just past was no exception. At Slate Hill, we wanted to turn off and visit an acquaintance in the village of Mayfield. We inquired of a man in a much bespatterd Ford as to the roads to said Mayfield. "Look at my bus—speaks for itself—just came from there—there's two 'roads'—whichever one you take, you'll wish you took the other."

And while on the subject of inquiring about roads, accept a pointer from one who has traveled and re-traveled hundreds of miles on the information supplied by pedestrians and others. Don't bother with garage employees if you want to get authentic directions—most of them know less about the roads outside of town than you do, and you are a stranger in the territory. Do this—stop a man driving a car and ask him; unless you pick a city delivery car, the chances are ten to one that your man knows the very road you wish to traverse. The amount of misinformation you can get from garage employees and volunteers is truly marvelous.

* * *

A peep into a garage back room out in Tioga County brought to mind a common fault in scraping bearings. Here a workman was scraping in the upper halves of a Ford block, but the principle is the same whether it is a Ford or a Peerless. He was using prussian blue, as is customary. And as it was about of the consistency of vaseline and he smeared it on "thick as butter," naturally he got a "bearing" all around the babbitt and all around the crankshaft journal, "proving that the latter was true."

Any one who "scrapes their own," and garage mechanics as well, should learn that a thin, dry coating is all that is required and is all that can be used if an accurate job is desired. Sometimes there may be a sixty-fourth to scrape off; no marking material is needed for such a job until the metal has been worked down within, say, .003 of an inch and when you get down as close as that, one of those smeary, mushy coats applied to the part easily fills up the difference between the high spots and the low spots thus completely defeating the purpose of the marking coat.

It is not an unusual sight in machine shops to see machinists scraping bearings without any marking material at all. They place the shaft in the bearing, press down on it, and rotate it through a quarter circle while pressing down. This produces shiny, black spots where the bearing is high and they follow this up until the entire surface shows this way—a real test of personal skill and mechanical accuracy.

In truth, one function of a marking material is to act as a lubricant between the two surfaces, preventing their scoring while being rubbed together—no preventative of this sort is needed for automobile materials, which means that the need for and the amount of marking material used is decreased by half. And bear in mind always that as the work grows more accurate, the coating must be thinner.

* * *

Our car had a narrow escape from being ditched in one soft spot because our attention was distracted by a man extricating himself from the worst mud hole in that same spot and when we had safely pulled out on dryer ground, we parked our car to go back and see his weapon. He had a device that he called a "one-man team," a name that seemed to fit it exactly for he was all alone and he got out of as bad a hole as could be imagined, got out without a team or tow, got out without racing his engine or racking the machinery.

Fig. 1 shows this. There was a casting about a foot in diameter and an inch thick that was threaded to screw on

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the hub of the Ford in place of the hub cap. The threaded hole was way off center. When screwed on snugly, an ordinary spring clip was passed through two drilled holes and clamped over a spoke with a steel plate and two thumb nuts—this prevented unscrewing and acted as a driver. The casting was screwed on until the high part of the eccentric was "up." Then he had a piece of structural steel—a piece of three-inch channel as long as his running board and with the ends bent down for legs. This was placed close to the wheel and directed as may be seen by reference to the drawing. When the car is started, the eccentric turns with the wheel but soon comes in contact with the channel and this contact lifts the car up and carries it along a firm path, depositing it about three feet ahead of its stuck location.

"I could use a log or piece of fence rail instead of this channel," said the triumphant one, "but this is light and strong and I always have it with me on trips like this—strap it on the running board. I've traveled the notorious roads of the South and I always got myeslf out alone. Almost always, it's just one wheel that is mired—the other would come along all right if you didn't spin it—with my invention, I go after that mired wheel and I put it on a firmer foundation right away.

"Usually all you need is a couple of feet to get out of any hole but if necessary I can re-set my 'mechanical log' so easily that I can advance at the rate of three feet a minute. It might not work on heavy cars but it's O. K. for Fords."

Some of the car owners along the Southern Tier have devised novel methods of keeping the Ford in shape. Fig. 2 is an example of this. The front axle spindle bolts are small and these joints get worse pounding than any other parts of the car, which naturally brings on early wear. If the area of the surfaces bearing this load is increased, the life of the joint will be increased in almost direct proportion.

The knuckles on the car, from which Fig. 2 was copied, had been put in a lathe and the ends near A and B had been machined round, but only enough taken off them to clean them up. Then U-shape pieces had been forged and fitted to these cylindrical surfaces and clamped fast to the axle ends as shown. Thus the wear was distributed over more than twice the original surface and the day of loose fits indefinitely postponed.

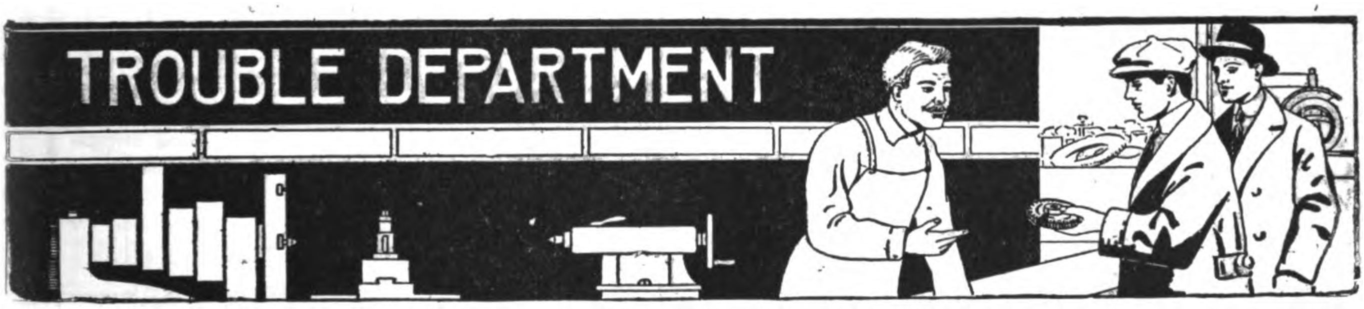
* * *

ONE PLACE THAT STUMPS 'EM

"No city," says a newspaper story, "has yet solved the problem of the reckless automobile speeder."

How about Venice?—*Detroit Motor News.*

Indifference to what people say is the prerogative of only those who know that they are doing the right—



Grounding Generator When Running Without Battery

3000

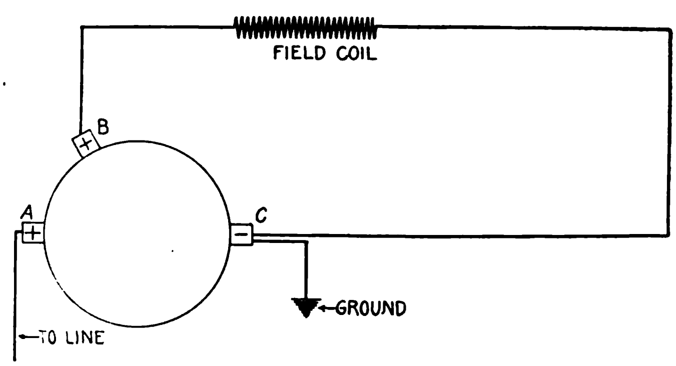
From Walter J. Smith, Wisconsin: I have questioned many people around here but nobody seems to know why the generator on a Ford car has to be grounded when running without battery. Is it not a dead ground or a dead short circuit?

Reply: By a strange co-incidence your letter came into this office in the same mail with a second letter of the same nature. These two letters are the first we have ever received concerning the grounding of a Ford generator when the battery is not in use. We do not recommend the grounding of the machine but suggest that the 3rd brush be removed instead.

If you will refer to the accompanying illustration you will see that all of the current for exciting the field coils is taken from the third brush and the negative main brush. The 3rd brush is positive while the other main brush is negative and the potential difference is great enough to excite the fields and cause the armature to generate current. The armature current is taken off from the positive brush which is connected with the line as indicated in the sketch.

For convenience we have lettered the three brushes A, B and C. A is the main, positive brush; B the third brush; and C the main, negative brush.

Let us assume that the machine is in operation and that



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the potential between A and C (main current) is 6 volts. At this time the potential difference between B and C (for exciting the fields) is between 5 and 6. It will serve to assume that the potential is 5½ volts. From theory, then, there will be a difference in potential between the two positive brushes A and B of about ½ of a volt and a test would then indicate that A still remained positive while B, as regards A, would be negative.

As the machine increases in speed and the lines of force are distorted the potential between B and C decreases slightly, cutting down the field magnetism and reducing the potential between A and C. But, since voltage increases with speed this factor will result in increasing the potential between A and C and this fact coupled with the first results in an even potential of 6 volts between A and C practically all of the time. The voltage between A and B decreases at approximately the same ratio as it decreases between B and C; therefore it is fair to assume that the full amount of current passing between A and B never exceeds the ½ volt which we originally found.

This last fact indicates that from A to B is practically a "short" through the armature. Then if A is grounded it amounts to almost the same thing as though B were grounded. If B is grounded no current passes through the field coils. If no current passes through the field coils then no current is generated. Therefore by grounding the line wire the field coils are shorted and the generator becomes practically inoperative.

Practically, however, the difference of ½ of a volt between A and B means the generation of a small amount of current and the generator will work under a load at all times while the machine is grounded. This load will not be more than the difference in potential between A and B;—probably much less because of the location of B in relation to A on the commutator. The speed of the commutator and the shape of the field magnets, the quality of the cores of both the magnets and armature are all doubtful quantities so that it is impossible, except through actual tests, to say just how great a load the generator works under while the main line is grounded. Naturally it cannot be so great as though the machine were connected with the battery.

This type of generator which regulates, in itself, its output is undoubtedly the best "fool proof" machine made. The third brush system of regulation is being adopted by most of the small dynamo manufacturers.

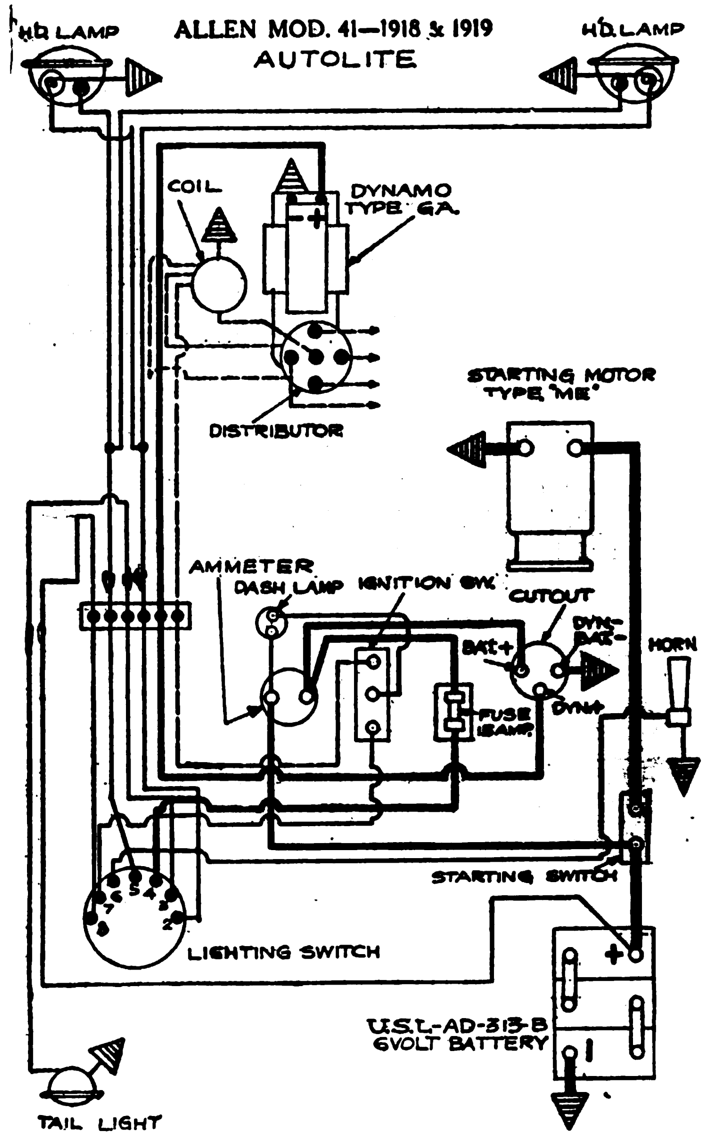
In relation to your last remark to the effect that a dead short circuit will burn out any machine. This is only true of compound and series would machines. You can see the fallacy in this as applied to the generator just described. Suppose, however, that you considered a plain shunt wound generator (not a practical machine). If you shorted the armature you would immediately short out the fields and there would be no field current. Then there would be no current generation except from such residual magnetism as might remain in the iron of the fields—very negligible.

As a general rule if either the armature or the fields are shorted then the machine becomes inoperative. This is also true of the Ford generator.

Wiring of Allen, Model 41

3001

From Alfred Garttner, New York: Will you kindly print the wiring diagram of the Allen 1917 car, Model 41, which is equipped with the Auto Lite starting and lighting system?



Reply: The Allen Model 41 is not a 1917 car. It was built in 1918 and 1919. We are printing this diagram herewith.

If An Axle Breaks on a Hill

3002

From R. J. Moore, New Hampshire.—Can you tell me what should be done should an axle on a car break while the machine is running up or down a hill?

Reply.—Your question is well worthy of consideration because few people ever think of such a possibility. Instruction books and magazines tell what to do in case the breaks become inoperative but leave your question to the imagination. We might advise you to drop off of the rear of the machine or drive it into the nearest stone wall before it accumulated too much momentum without departing far from the serious side of the problem, because there is absolutely

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no means at your disposal to stop the machine once the shaft breaks and the wheel slips out far enough to separate the brake drum from the bands.

The first warning you will have of the axle breakage will be from the refusal of the brakes to work. If the car is going up hill when the accident happens and you know that the gears are in mesh you will realize immediately what has happened. Before the car has time to gather momentum backward steer it against the curb and cramp the wheels just enough to hold it against the curb but not enough to allow it to mount over the curb to the walk.

If there is no curb then swing it into the nearest post, wall or other obstruction. This course will be fairly safe as far as you are concerned unless the car has gathered much momentum. In such an event straddle the steering gear, facing backward and steer the car backward down the hill. You can steer much better in this position than with your head turned.

If the axle breaks when going down a hill and there is no curb to steer against, then keep on the right and try to avoid other obstacles as much as possible.

Although your question is a serious one, it falls into the class of that which was asked by the amateur aviator. This young man, who was looking for safety information asked his instructor what he should do if both wings of his machine should crumple when he was several thousand feet in the air. His instructor answered by telling him to pick out the softest spot he could find and then jump—if he happened to land on that soft place he might come out of it alive, but if he didn't —well he would have to take a chance anyway.

So it is with certain automobile problems such as the one you have presented. The writer is of the opinion soon as he was sure that the axle had broken. that he would try his best to leave the machine just as

Graphite in Ford Engine

3003

From Paul W. Davis, Missouri: Do you think that graphite used in a Ford engine would keep it from missing when the cylinders are pumping oil?

Reply: Graphite is a good conductor of electricity and for this reason should not be used on electrical apparatus. Graphite if used in the base of the engine will short-circuit the magneto in a majority of cases. At any rate it will soon form a coating over the magneto contact terminal at the top of the housing and cause a short-circuit at this point.

There is but one way to use graphite in the Ford engine and that is to feed it into the carburetor intake. The use of graphite at this point is to be recommended because it will fill up cylinder scores and form a smooth coating over the cylinders if there are any irregularities in them.

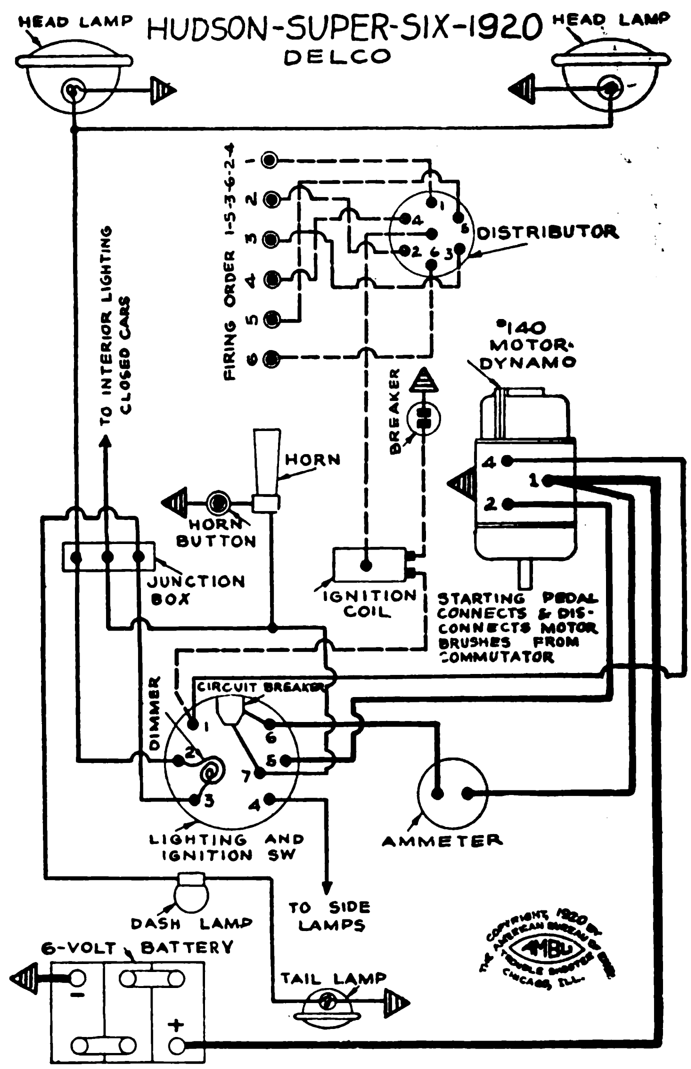
Whether or not graphite will help in your case cannot be said because there are so many reasons for oil pumping. We should advise you to try the graphite because it may do a lot of good and cannot do any harm.

While the engine is running at a fair rate of speed feed a tablespoonful of fine flake graphite into the carburetor air intake. Feed the graphite slowly and do not use more than this amount. After a few moments the engine will probably begin to skip, due to short-circuiting of the spark plugs. Run the engine for a time anyway and then clean the plugs. For the first hour of running, you may be obliged to clean the plugs two or three times; after that, however, the graphite will have been deposited on the cylinders.

Wiring of Hudson, Model O 1920

3004

From H. E. Pledger, Maine: Will you kindly publish a wiring diagram of the Hudson Super Six, Model O, 1920 limousine.



Reply: We print above wiring diagram of the Hudson Super Six, 1920, equipped with the Delco System.

(Continued on page 51)

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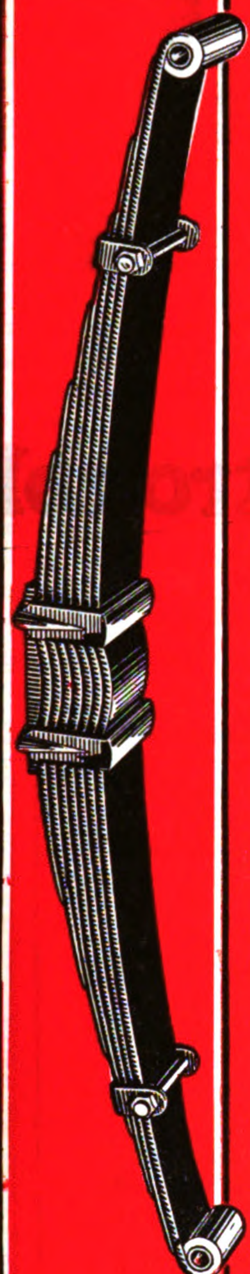
Send For This



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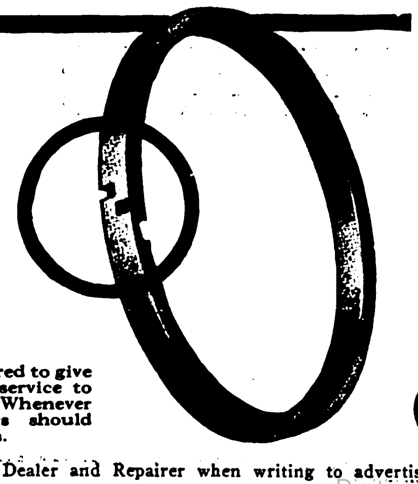

39 Branch Offices prepared to give practically 24-hour service to the entire trade. Whenever possible, however, dealers should order through their jobbers.

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Wiring Trouble

3005

From John Howie, Oregon: I have a 1915 Dodge car and there seems to be trouble somewhere in the ignition system for at times the motor will start and at other times I cannot even get a spark. Sometimes it is even impossible to use the horn. I have traced the wiring down using a wiring diagram which I have and found the terminals are all right. The battery is in a good condition.

Do you think that the trouble might be in the indicator on the dash? Although I have searched, I cannot find any place where the insulation is worn off, so as to cause a short. Can you help me out?

Reply: The circuit from the battery to the lighting and ignition switch as well as to the horn is simple. You will note from your wiring diagram the current passes from the battery to the indicator and from the indicator is distributed to the various units. To find your trouble you will need to make a few simple tests while the trouble exists.

We will assume that you car will not start, as indicated in your letter and you try to blow the horn as a first test. You cannot get any current to this unit. It is evident that there is trouble between the distribution point on the indicator and the battery itself. First short-circuit the indicator by placing a clean copper wire across the two indicator terminal posts. If the indicator is at fault this short-circuit will cure the trouble for the time and a new indicator should be installed.

If the short-circuiting of the indicator does not help matters you can be sure that the trouble is in the wire leading to the battery (assuming that the battery gives the current). Replace this wire, for the time with another one and see if the trouble is cured. If so, install a new wire of the same size as the old one. If trouble still persists it is an indication that the battery connection is poor. Remove the connector, scrape it well, and replace it and your troubles are over.

If, in the first case, you could not obtain ignition current, but the horn worked all right, the trouble is in the ignition line. Go over each section from unit to unit and install a new wire in each case, disconnecting the old one.

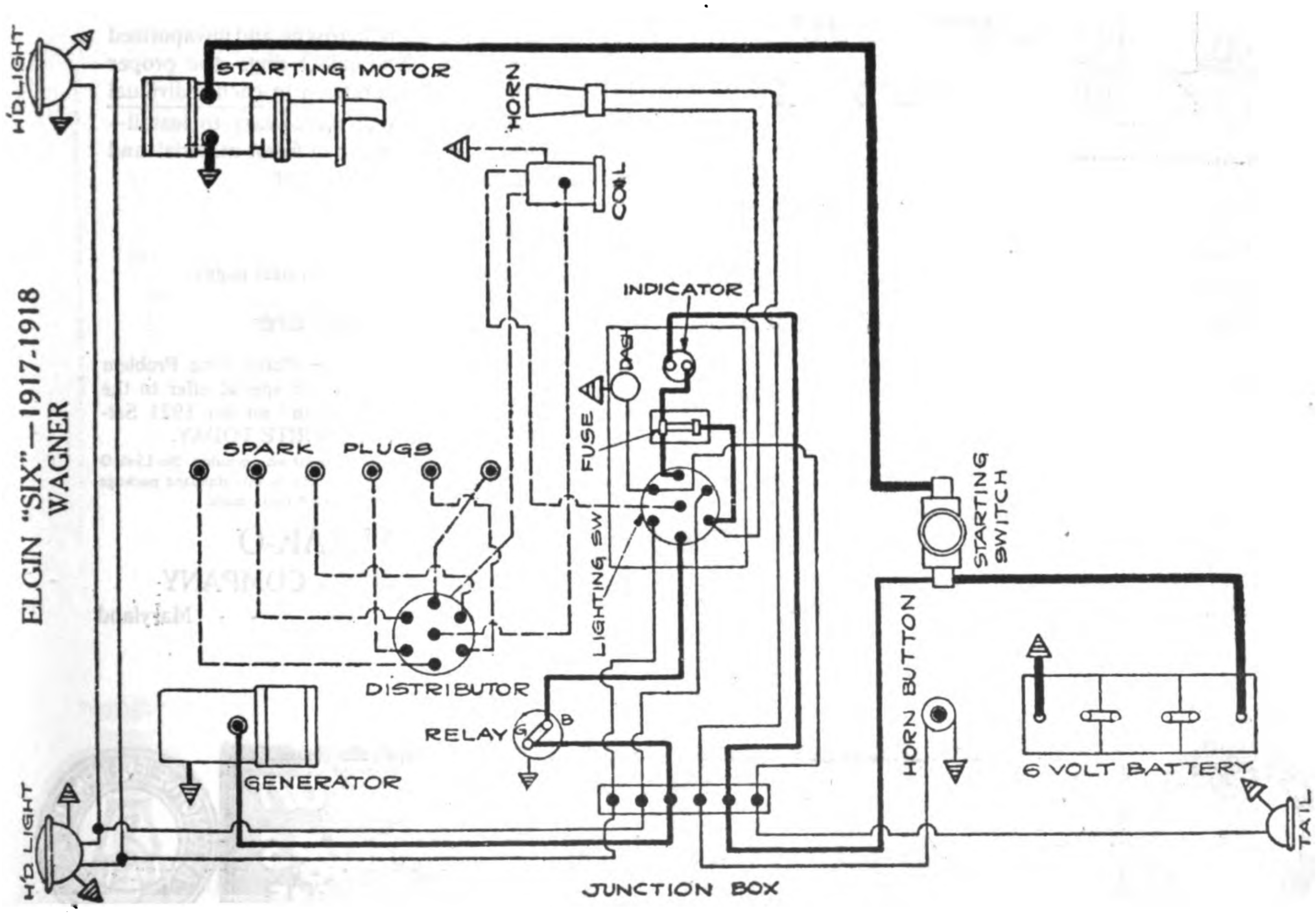
If there is a short-circuit in the line at any point the indicator will show "discharge" when that line is thrown on at the switch, even after the light bulbs are removed or the ignition wire disconnected at the ignition head.

Wiring of Elgin, 1917-18

3006

From Cline Bassett, Pennsylvania: Will you kindly print the wiring diagram of the Elgin "Six," 1917 car?

Reply: We print above diagram of the wiring used on the Elgin "Six" 1917-18 car, equipped with the Wagner system.



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No-Leak-O is the only piston ring with the original, patented, "oilSEALing" angled groove. The No-Leak-O groove is non-leaking, non-clogging, maintains a constant oil seal between the piston and cylinder walls and when reversed in the top groove of each piston keeps kerosene and unvaporized gasoline out of oil pit. No-Leak-O rings give proper Oil Control and High Compression in each individual ring. They are made in one piece—easy to install—guaranteed for accuracy—made of finest material and combine high efficiency with low cost.

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(See condensed price list on next page)

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Write us today for free booklet "The Piston Ring Problem and its Solution."—Also price list and special offer to the trade. Let us tell you how to "cash in" on our 1921 Saturday Evening Post Advertising. WRITE TODAY.

IMPORTANT: In buying Piston Rings insist on genuine No-Leak-O with the Original "oilSEALing" groove, packed in this standard package bearing the famous ring and seal, our registered trade mark.

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	3 3/4	"	x 17/64 "	
55c	3 3/4	"	x 9/32 "	"
	3 3/4	"	x 7/16 "	
60c	3 13/16	"	x 3/16 "	"
	3 15/16	"	x 1/4 "	
65c	4	"	x 3/16 "	"
	4 1/8	"	x 1/4 "	
70c	4 1/8	"	x 9/32 "	"
	4 1/4	"	x 1/4 "	
75c	4 1/4	inches	x 9/32 inch	*Up to*
	4 3/8	"	x 3/8 "	
80c	4 1/2	"	x 3/16 "	"
	4 3/4	"	x 1/4 "	
85c	4 3/4	"	x 9/32 "	"
	4 3/4	"	x 5/16 "	
95c	5 1/2	"	x 1/2 "	"
	5 9/16	"	x 3/8 "	
$1.00	5 5/8	"	x 5/16 "	"
	5 3/4	"	x 3/8 "	

Write for complete price list on Standard and "over" sizes. All No-Leak-O rings combine highest efficiency with lowest cost.

No-Leak-O Special Representatives

If you have any trouble getting No-Leak-O Piston Rings from your regular jobber or dealer write our representative nearest you—he will see that you are promptly supplied through your jobber.

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Mr. J. B. Mitchell, 109 Cascade Ave., Atlanta, Ga.

Mr. W. M. Harkrader, 3629 Pine Grove Ave., Chicago, Ill.

Mr. F. A. White, Charles St & Lafayette Ave., Baltimore, Md.

Mr. F. B. Archibald, 32 Colton Place, Longmeadow, Mass.

Mr. C. E. Stevenson, 411 Lathrop Bldg., Kansas City, Mo.

Mr. Theo. Rowe, 149 Summit Ave., St. Paul, Minn.

Mr. L. E. Malican, 62 19th Street, Elmhurst, Long Island.

Mr. F. J. Holmes, 352 Hayward Ave., Rochester, N. Y.

Mr. H. L. Strasburger, 302 West End Trust Bldg., Philadelphia, Pa.

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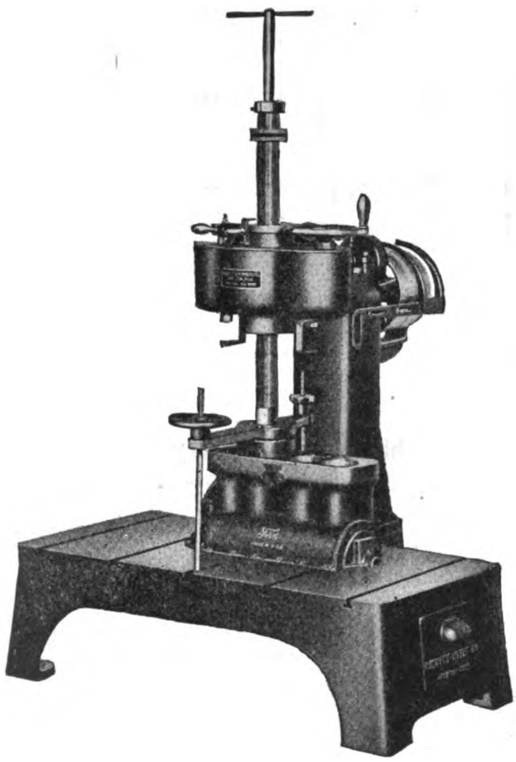
New and Useful Automobile Accessories

Hinckley-Myers Cylinder Reborer

Gas Engine cylinder walls generally wear oval in shape, due to uneven power thrusts and varying hardness of the metal composing the surfaces. The rings maintain compression as long as the cylinders are fairly true but sooner or later the engine ceases to deliver its normal power and the cylinder must be refinished.

The Hinckley-Myers Co. of 18 North Michigan Ave., Chicago, Ill., are marketing a cylinder reboring machine which is illustrated herewith. This machine will rebore any open head cylinder block which does not exceed 20 inches in height and ranging in diameter from 2 13/16 to 5 inches.



The bed of the machine is but a few inches above the floor which lessens the amount of lifting necessary to put the block in place. The pilot bar is lowered through the cylinder, after the block is in place and centers in a hardened bushing on the base, thus forming a rigid center for the boring tool or cutter head which contains three adjustable cutter blades. Each blade may be set independently and accurately by a micrometer gauge to the exact size desired. Provision is made for accurately centering and clamping the block to the bed.

The cutting bar which runs in bronze bushings at both the top and bottom of the power head, is driven by hardened steel worm and bronze gears and double pitched spur gears at a rate of approximately 40 revolutions per minute. The boring tool is fed automatically and is provided with an adjustable stop collar, previously set to stop the tool at the bottom of the cylinder.

The manufacturers claim that it is seldom necessary to burnish the cylinders after using this tool. As a rule, the power consumed is about one horse power. The machine may be said to be entirely automatic and does not require a skilled mechanic, so simply it is in operation.

The Baltimore Commutator

Those Ford owners who are experiencing difficulty with the timers of their cars would do well to investigate the Baltimore commutator. The manufacturers of this commutator claim that this device is economical, practically indestructible and most efficient. They also state that it runs dry, needs no oiling and is water-, oil- and dust-proof.

They claim that the owner of the Ford car is enabled to obtain more power, a better spark, dependable action and ease in running his car when he installs their commutator.

Full details regarding this device may be obtained from the Baltimore Commutator Co., Inc., Key Highway and Webster St., Baltimore, Md.

The "Protex" Signal

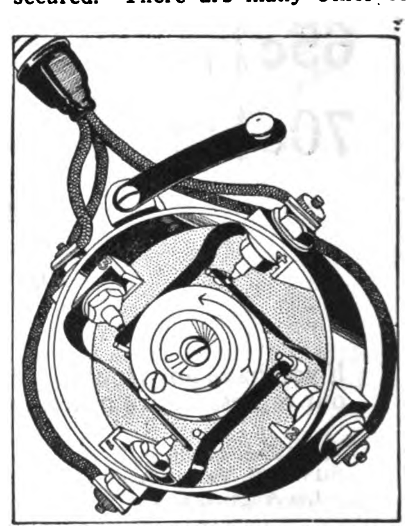
The "Protex" Signal warns cars behind, of the driver's intention to slow down, stop or turn, and thus is said to avoid collision and accident. It is self-acting, wholly without thought, effort or consciousness on the part of the driver.

Slight pressure on the brake pedal turns electric current into the signal lamp on the left rear fender and a bright penetrating red light flashes the warning letters "Stop" into the eyes of drivers following. This light remains on until the brake pedal is released.

"Protex" is effective day or night, in sunshine, rain or fog. The brilliant light is secured by a reflector throwing the rays through patent lenses forming the letters of the word "Stop," and thus intensifying the light. It is manufactured by The Protex Signal Co., Park Bldg., Cleveland, O.

Accurate Timing System and Ignition Lock for Fords

The Accurate Timing System and Ignition Lock for Fords which is manufactured by the Safstrom Manufacturing Company, 6706 So. Chicago Avenue, Chicago, Illinois, is a device which, it is claimed, brings the timer away from the oil and dirt up to the level of the cylinder head, thereby making it possible to inspect the inside works while the motor is running, by simply removing the top cover. The cam of this device is made in two parts, and by removing the top half a positive ignition lock is secured. There are many other features of this device which will appeal to the Ford owner and it will pay readers to write to this company and receive full details in regard to it.



The Nojak

All of us have wished that we could eliminate the jack from our tool kit but unfortunately we have always realized that thought the jack was a necessary evil, it was a necessity. But now comes the "Nojak" and perhaps it has solved our problem and we can leave our heavy jack at home.

The Nojak is what might be called "fully automatic," it has no levers or gears and one doesn't have to crawl underneath the car to adjust it for it adjusts itself.

To equip a car for a Nojak it is only necessary to drill and bush two holes in the felloe of each wheel. Then when the tire goes flat on the road it is only necessary to put the Nojak in place with the two steel pinions into the holes, run the car forward until Nojak lifts the car and the job is done. Nojak also acts as a convenient sand or mud hook. The illustration shows how Nojak looks when it is supporting one wheel of the car. Nojak is made by the Commercial Mfg. Co., 1489 East Fort, Detroit, Mich.

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Whiz Radiator Stop Leaks instantly stops leaking radiators,—it is a necessary part of a car's equipment—it must make good or the manufacturer will.

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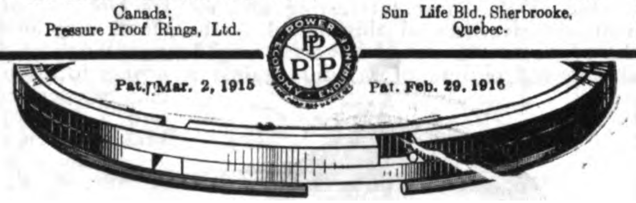

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No-Leak-O Piston Ring

The No-Leak-O Piston Ring Co. of Baltimore, Maryland, have announced that they have received what is said to be the largest piston ring order ever given by a jobber. This order was for an entire carload of No-Leak-O Piston Rings, and this is certainly a record. It is a little wonder, with this order in mind that the No-Leak-O Piston Ring Co. feels that prosperity is headed their way.

These rings were ordered by the Pennsylvania Rubber & Supply Company, and the No-Leak-O Piston Ring Co. states that the reason for this large order was that the Pennsylvania Rubber & Supply Company last year did not receive half of the rings that they desired and had calls for.

Baby Hammocks

The Baby Hammock Company with the main office at 18 Tremont Street, Boston, Mass., and branch office at 1440 Broadway, New York City, has published a circular showing the styles of Baby Hammocks which they are manufacturing. These hammocks can be used in the automobile, on the porch, in the woods or in the house.

They are extremely well made and when not in use can be easily fitted into a bag which is supplied for that purpose. The stand upon which the hammock rests can also be folded and placed in a bag thereby taking up a minimum amount of space.

Automotive Salesmanship Lecture Course

J. H. Newmark, Advertising Manager of the Chevrolet Motor Car Co., has completed an instructive and interesting course in salesmanship for the man now selling, or who wishes to sell automobiles, motor trucks and tractors. The three parts are separate, and consist of seven books for automobiles, eight books for motor trucks and five books for tractors.

These handy, pocket-size flexible books are filled with valuable information about the industry and its products, containing the boiled-down practical experience of many successful executives in finding and closing the prospect, compiled statistic, and much data of a useful nature.

It is published by the Leslie-Donald Company, 15 West 37th Street, New York City.

United Automotive Body Reduces Prices

The United Automotive Body Company, Euclid at 49th Streets, Cleveland, Ohio, announces that they have made a reduction in prices, ranging from ten to twenty-five per cent on all of their Ford commercial and passenger bodies. They also announce that they are opening two more Branch Assembly Plants at Detroit and Pontiac, Michigan. In this way they feel that they will be able to effectively serve the entire sales organizations of Motor Truck Manufacturers located in these cities.

New Directory and Market Data Book

Crain's Market Data Book and Directory of Class, Trade and Technical Papers, now off the press, promises to be of unusual interest to advertisers generally and users of trade and technical papers in particular. It not only lists all of the business publications of the United States and Canada, giving circulations, rates, type page sizes, closing dates, etc., but supplies a market analysis of each trade, profession and industry.

Thus the reader is given the basic facts of each line in which he may be interested, including its buying power, buying methods, character of requirements, etc. The volume, which is bound in cloth and contains nearly 500 pages, is published by G. D. Crain, Jr., 417 S. Dearborn street, Chicago.

Limo-Sedan Fan

The dog days are now here and those people who operate a Sedan car will doubtless find discomfort because of the heat. It will pay them to install some sort of a sedan fan, and the fan which is manufactured by the Knapp Electric & Novelty Co., 511 W. 51st Street, New York City, is a very attractive device. This fan can be easily fastened to the ceiling of the car or any other part of the tonneau.

The current consumption while running is only one and one-half amperes and all together the cost of maintenance is practically nothing. This Company also manufactures the Knapbilt Motor.

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Neo-Lite Auto Signal

The Federal Signal of Albany, N. Y., has recently developed and produced the Neo-Lite Auto Signal for the protection of cars and trucks against rear end collisions, by giving timely warning to the drivers of cars following. This signal is adapted for mounting on the rear end mudguard (or any one of several other locations) and is controlled from the driver's seat by means of a push button.

One of the most interesting and remarkable features of this signal is the Neo-Lite itself, which shows a rich orange-red outline of a hand against a

dull background, a combination selected on account of its striking visibility. The signal consists of a glass tube shaped in the form of a human hand, which tube is emptied of air and then filled with Neon. Neon is an element of the air, segregated along with argon, nitrogen, etc., when the air is split up into its elements to obtain pure oxygen. When the terminals of this glass tube are connected to a suitable source of electric energy the Neon immediately glows a bright orange-red, outlining the "Red Hand of Warning."

A special feature of this Neon glow or Neo-Lite is its high visibility under adverse atmospheric conditions, because its spectrum is rich in red.

The source of electrical energy is a small induction coil, the secondary coil of which is connected to the terminals of the signal hand (or glass tube), and the primary is provided with a leading-out wire and connector, wired in series with control button and storage battery of the car or truck. Push button operates primary winding of induction coil, and secondary winding causes the Neo-Lite signal to glow orange-red. In operation the primary circuit consumes about one-half an ampere from an ordinary six volt battery.

The manufacturers recommend that the signal be installed on the left rear mudguard of touring and enclosed cars, with the swivel-flange adjusted to fit the surface of the mudguard. Adjustment around the swivel bolt may then be made to bring the cover glass and main body of the signal to a vertical position when the swivel bolt is firmly clamped. Alternative locations are on the tire supports, rods or brackets, and special fittings are furnished for such alternative locations.

The control button can be located on the steering wheel, steering shaft, inside of left fore door, arm rest adjacent to driver, etc. The location of this control button has received careful study to find a position to which the driver's hand will move easily and naturally when it is desired to give a warning of change in speed or direction. The locations enumerated have been tried and deemed desirable, by reason of their ready accessibility. On some machines the button may easily be located convenient to the left hand and also to the left knee of the operator, which location leaves one arm free in case of emergency, so that the clutch may be depressed and the warning signal operated in one movement. By proper location of control button, signal may be operated without conscious effort, and as naturally as applicatin of the brakes, when traffic conditions demand. It is manufactured by Federal Signal Co., Albany, N. Y.

The Valley Buffer and Grinder

The Valley Electric Company of 3157 South Kingshighway, St. Louis, Missouri, have just brought out a garage machine of great utility at perhaps the lowest price of any machine in its class; we refer to the Valley Buffer and Grinder.

The buffer and grinder machine can be obtained in a number of styles and sizes from ½ H. P. to 5 H. P. It may be had for practically any voltage of alternating current and for single, two or three phase.

The machine is sturdy and dependable and designed for the heavy duty required for grinding. The armature is mounted on double-row, self-cleaning SKF ball

bearings. The end plates are solid and the machine is practically dust-proof. This feature alone makes for long life.

The armature shaft is especially long and is designed to carry a grinding wheel at one end and a buffing wheel at the other, but other combinations can be used. In the small garage, where grinding and buffing are incidental, though necessary, one end of the shaft may be fitted with a pulley and the machine used for driving other machines. In other words, the Valley grinder may be considered as "an all-around utility motor."

The motor is mounted on a heavy cast iron pedestal, solid enough to eliminate all vibration. The balance of the armature and the ball bearings also help to make the machine a smooth running motor.

The motor may be had, mounted on a high, circular stand as illustrated, or upon a low stand for bench use. Grinding wheel guards are furnished at a slight addition in price.

Leterain

Leterain is the outcome of a discussion of automobile accidents by three practical

men while dining one winter's evening at the Old Colony Club in New York. These men,—Dr. John C. Baker, an eminent chemist; Victor B. Johnson, former assistant copy and art manager of the Street Railways Adv. Co. and Ben J. Sweetland, president of the Ben J. Sweetland, Inc., Advertising Agency,—each agreed that most rainy day accidents are directly caused by blurred windshield vision.

That this existing danger has long been recognized is proved by the number of attempts made to find a remedy.

Doctor Baker seemed to feel that he could solve the problem. He sought and found chemicals of lasting quality that would act as an insulating medium and destroy the existing affinity of the water for the glass, permitting the rain to flow off in thin, transparent sheets.

Dr. Baker next discovered a non-drying chemical which could be used as a base and by combining it with the others could use them impregnated in fabric so that no liquid would be required. A fabric mitten was then devised to hold these chemicals and actual tests showed that a sufficient quantity could be retained to give a year's service. One treatment on a windshield was also found to outlast 12 hours of the heaviest rain.

Leterain as this has been called can be applied when the glass is either wet or dry and when applied dry, a transparent coating is deposited that in no way interferes with the driver's line of vision. Actual tests are said to have proved that the glass may be treated, say Monday, and if there is no rain until Thursday the insulating chemical deposit will still be there.

The B. J. S. Products Corporation of 95 Liberty Street, New York, was incorporated to market Leterain.

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Classified Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance. No advertisement will be inserted for less than one dollar, however small.

Remittances may be made in postage stamps or in any convenient way.

Special rate of 40 cents per non-pareil line for each insertion if taken for 12 consecutive titmes.

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York

Gears and Parts

Steel Gear Rings

For Self Starters

For Replacements or New Installations

Send us your Old Fly Wheel and we will quickly fit it with a Steel Gear Ring—Better than Cost Iron Gears. Our Prices Will Interest You.

CYLINDER REGRINDING

on Automatic Machinery

BROKEN PARTS WELDED or DUPLICATED

TRY US FOR SERVICE

THE ADAPT MACHINERY CO.

1624-1632 S. Wabash Ave. Chicago, Ill.

Want to Hear From

WANT to hear from owner having automobile or other business for sale. Give cash price and particulars. John J. Black, 223rd, St., Chippewa Falls, Wis.

Salesmen

SALESMEN who call on Jobbers or Dealers of Automobile Accessories.

Grand opportunity is open to sell a wonderful little device for Fords and Chevrolets the merit of which is seen the moment you show it—no demonstration—you sell it or fail in one minute, really you do. Just starting to market it and first salesman actually sold the first six out of eight concerns called on. Can be carried in your pocket.

The commission really is very liberal and it can be handled along with the other items you are selling. We ship the goods to the concerns—you sell on open account—you can sell anywhere as we do not give restricted territory. A half live man without prestige or friendships with the Jobbers or Dealers should make $300.00 per month additional selling this device.

Does not interfere with what you are now selling and you will do well to write at once—now is better than tomorrow. Address C. B., c/o Automobile Dealer & Repairer, 58 E. Washington St., Chicago, Ill.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Help Wanted

HUSTLERS WANTED in exclusive territory to sell the fastest selling accessory in the automobile field today. Workers making $600.00 monthly. Every car owner a live prospect. Write immediately. Indiana Parts Company, Eclipse Vizor Department, Richmond, Indiana.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., 384-6 East 133d St., New York City.

CARBOLUX)B-N(PISTON PINS

Standard .003, .005 and .010. Oversize in Stock

THESE JOBBERS STOCK)B-N(PINS

Atlanta, Ga.
Bailey & Co. Inc.
Pasco Tool Co.
Chicago, Ill.
E. D. Kimball & Co.
Cincinnati, Ohio
The Julius J. Bantlin Co.
Davenport, Iowa
Sieg Company
Dubuque, Iowa
Midwest Auto Supply Co.
Fort Wayne, Ind.
Fort Wayne Iron Store Co.
Indianapolis, Ind.
Homer A. Koller Co, Inc., 415 N. Capitol Ave.,
Kansas City, Mo.
Faeth Company
Lincoln, Nebraska
Nebraska Buick Auto Co.
Little Rock, Ark.
Bailey & Co. Inc.
Louisville, Ky.
Peaslee-Gaulbert Company, Inc.
Milwaukee, Wis.
Shadbolt & Boyd Iron Company
Minneapolis, Minn.
Minneapolis Iron Store
New Orleans, La.
Oliver H. Van Horn Co. Inc.
Oklahoma City, Okla.
Sharp Auto Supply Co.
Omaha, Nebraska
Sunderland Mach. & Supply Co.
Peoria, Illinois
Cummings & Emerson
Philadelphia, Pa.
R & L Bearings Co.
Pittsburgh, Pa.
Trantor Mfg. Co.
Portland, Ore.
Ray Daley, 91—11th Street
Salina, Kans.
Watson-Welden Motor Supply Co.
St. Louis, Mo.
Beck & Corbitt Iron Co.
Syracuse, New York.
Onondago Auto Supply Co.
Frostholm Bros.
Topeka, Kans.
W. A. L. Thompson Hardware Co.
Toronto, Canada
Automotive Equipment, Ltd., 101 Church St.
Washington, D. C.
National Service Company, Inc.
Wilson, North Carolina
Hackney Bros, Inc.

MAIN OFFICE AND FACTORY:

BURGESS-NORTON MANUFACTURING COMPANY

500-526 PEYTON ST., Dept. C, GENEVA, ILL.

THESE BRANCHES CARRY STOCK:

Providence, R. I.	4 Meadow Street.	Tel. Union 4082-W
Cleveland, Ohio	402 Nat'l City Bldg.	Tel. Main 184 & Cent. 1765-R
Chicago, Ill.	2450-2 S. Wabash Ave.	Tel. Calmuet 263
San Francisco, Cal.	717 Ellis Street	Tel. Franklin 2963

SERVICE OUR SPECIALTY

Ford Starter

DON'T BREAK YOUR ARM CRANKING YOUR FORD. Miller Ford Starter will crank safely from seat. Installed easily with ordinary tools. Send for circular. Price $5.75 postpaid. Reference Dun or Bradstreet. H. A. Miller, Memphis, Mo.

For Sale

FOR SALE—Blacksmith shop and garage; doing good business. Andrew G. Hart, Haverhill, Mass. Ayus Village Dist.

Gasoline Saver

Use "HI-LIFE" makes gasoline 30% cheaper, mileage 30% greater, prevents carbon, harmless to motors, money back guarantee. Price $1.00 treats 100 gallons gas. Salesmen wanted. Fry Mfg. Co., P. O. Box 1183, Portland, Ore.

Auto Mailing Lists

Passenger Cars, Trucks, or Special

We have all of the most recent available motor vehicle registrations in every state—can promptly furnish complete states or individual counties. Send for our free booklet of statistics and prices.

MOTOR LIST COMPANY

419 Grand Ave. Des Moines, Iowa

DON'T BE MISLED. But buy Massachusetts motor vehicle registrations direct from the original publishers. Whole State or by Counties, Cities and Towns. 1921 lists. Auto List Publishing Co., 138 Pearl St., Boston, Mass.

Patent Attorneys

PATENTS PROCURED AND TRADEMARKS REGISTERED—Eighteen years' experience. Instructions and Terms on request. Robb, Robb and Hill, Attorneys at Law, 888 McLachlen Bldg., Washington, D. C. 1340 Hanna Bldg., Cleveland, Ohio.

DON'T LOSE YOUR RIGHTS to patent Protection. Before disclosing your invention to any one send for blank form "Evidence of Conception" to be signed and witnessed. Form and information concerning patents free. Lancaster & Allwine, 212 Ouray Building, Washington, D. C. "Originators of the Form 'Evidence of Conception'."

PATENTS—Send for free booklet. Highest references, best results. Promptness assured. Send model or drawing for examination and opinion. Watson E. Coleman, Patent Attorney, 624 F St., Washington, D. C.

PROTECT your rights. Write for "Record of Invention" which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 612-E Columbian Building, Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

Special Sale

"Special Sale" on all kinds of tires and tubes. New and Double Tread Tires guaranteed. Write for prices stating size. I. Jaffess, 1319 Fifth Ave., Now York City.

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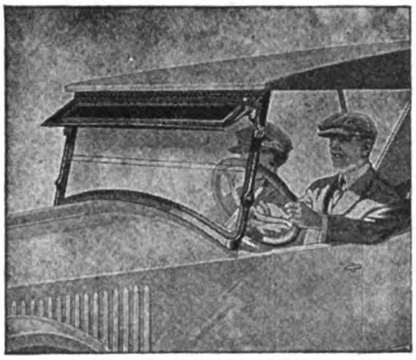
A New Product of an Old Concern

At home on the finest cars, the Troy Sunshade Visor is equally adaptable to the less pretentious models.

It is a product of the factory that has led for years in design and manufacture of high grade windshields, continually in close touch with leading car and body manufacturers.

The Troy Sunshade Visor has a light but rigid frame of U-shaped steel electrically welded. Covered with Du Pont Double Texture Rayntite fabric, well padded to prevent wrinkling or sagging. These features help keep the rain from dripping or blowing on the windshield.

The ingenious fixtures permit of adjustment to suit the driver's convenience. They hold the Visor firmly in place under all conditions. They set close up with nothing on either side to increase



the "blind spot" or interfere with vision. Attractively finished in brush-applied, baked enamel with nickel plated wing nuts.

Removal of R. G. Smith

The R. G. Smith Tool & Mfg. Co. announce that they have moved from 315 Market St., Newark, N. J., into a larger factory at 245-247 N. J. R. R. Ave., Newark, N. J. In their new quarters they will engage on a larger scale in the manufacture of their recently developed "Standard Radius Lathe and Planer Tool," each set of which includes the Smith "Cutting-off tool" and threading machine.

This company is also fully equipped for the making of special tools, moulds, dies, jigs, gauges and fixtures, and they are now able to fill orders as rapidly as they receive them.

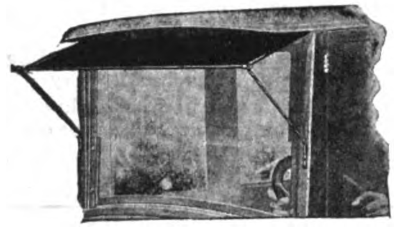
Valve Re-Facing and Re-Seating Tools

It is claimed that the American Adjustable Valve Facing Tool trues to a perfect point of accuracy any size valve from one inch to three inches at any angle or degree. This tool is adjustable to all sizes now used in motor cars, trucks and tractors without the use of any extra bushings or parts.

The re-setting tools which this company manufactures are equipped with different size pilots to fit the valve guides of all motors, thus insuring accurate work. They are made in two sizes: the one size adjustable to valve seats from one to one and seven-eighth inches, and the other from one and seven-eighth inches to three inches in diameter.

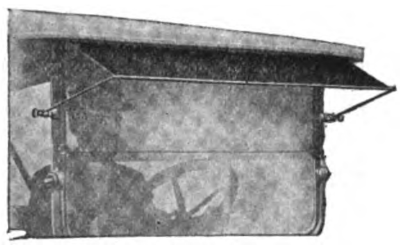
Vizor Is Latest Vulcan Product

The Jenkins Vulcan Spring Company of Richmond, Ind., are entering into the production and distribution of Vulcan Vizors on a large scale, according to a



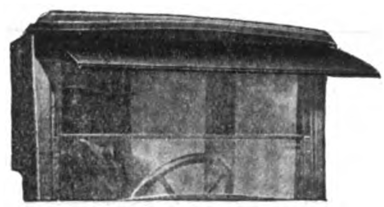
recent announcement.

Vulcan Vizors will be produced in three types. A fixed type universal for all closed cars with straight fronts, known as type "A." This will be in effect a part of the car itself, and the design is of such an artistic nature as to blend harmoniously into the lines of the car. The most careful engineering research was



used as a basis for determining the length, slope, and other dimensions of the vizor to take care of the average type driver. Type "B" is a universal, adjustable type for all closed cars.

Vulcan Vizors are made of the very best grade of Armco rustless, cold rolled,



20 gauge steel. They are non-rattling, and the finish is a special dull black effect in baked enamel.

The vizors are designed to be easily applied, and to operate satisfactorily after application is made. Vizors are in great demand, as they are almost a necessity for protection from headlight glare, direct and indirect sun rays, rain, snow, sleet, etc. Vulcan Vizors are sold exclusively through the jobber trade.

New Stutz Dealers

The Stutz Motor Car Co., of America, Inc., Indianapolis, Indiana, announce that the following names have been added to their list of dealers and are now legalized distributors for the Stutz Motor Car Company of America, Inc.

Hebbard & Kline, Mohawk, Michigan.
Welch Brothers, Springfield, Ill.
Auto Service Company, Two Rivers, Wisc.
Houff Motor Company, Staunton, Va.
H. L. Knauf, Ladd, Illinois.
J. W. Mashak, LaCrosse, Wis.
Geo. H. Smith Automobile Co., Haverhill, Mass.
Bettys-Williams Co., Rochester, N. Y.

The Perfex Radiator

On April first of this year, the Perfex Radiator Company of Racine, Wisconsin, announced a new product to their jobbers, the Perfex Radiator for Ford cars.

The core of this radiator is made by a special process from metal which is especially heavy. The metal used is a special bronze alloy which is not affected by alkali or lime water to such an extent as the conventional radiator used. The tanks, at the top and bottom, are drawn from one piece of material, thus eliminating all seams. Each tank is reinforced with a 14 gauge plate at each end, to which the bracket is bolted.

The suspension of the radiator is by a patented spring arrangement which allows for a five inch deflection in the chassis without distorting the radiator.

Burlock Non-Skid Tire

New to the motoring public although not new to the tire world comes the Burlock Non-Skid tire. This new construction employs coiled wire mesh in the tread of the tire, anchored in the base of the tread in such a manner as to always present to the road surface a series of wire teeth or claws which cut through the oil and grease on pavements and give a holding or gripping surface to the tread.

The manufacturers of the tire, the Burlock Non-Skid Tire Corporation, 84 Reade Street, New York City, claim the tires to be equal to chains for holding on hard surfaced roads, that they are to a large degree puncture proof, and guarantee their product for 8500 miles.

The emphasized feature of the tire is in the non-skid feature which is retained to the last mile. It is said to be as effective on ice as on slippery pavements.

The Burlock Non-Skid tire is in use by the New York Police Department in the department of detectives.

Success of Never-Fail Carburetor

The manufacturers of the Never-Fail carburetor, the Neverfail Carburetor Co. of Long Island City, New York, have been very successful in the marketing of their product. Their nation-wide merchandising and advertising campaign has been a large factor in assisting in the distribution of their product. They have increased their factory space and output and the sales manager reports that the sales are constantly growing.

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build up, so narrowing the passages that, even if a more serious choking is not caused, at least greater pressures have to be overcome than the engine was built to take care of.

The specific conditions about the car and the temperature under which the engine operates affect to a large extent the type or viscosity of lubricant to use. A high authority recommends it is advisable to use for the lubrication of internal combustion engines on the automobile an oil of 300 to 350 seconds viscosity. Any oil of this viscosity can be used and gives fair results if the cylinders are cleaned frequently, but a special low-carbonizing oil is preferable.

Another Condition

Another important condition that a good lubricant must meet is its proper action under the trying dust conditions of a March day in a city street, since street cleaning has gone so woefully and almost completely out of fashion, or a July day on an unoiled country road. The air is filled with fine particles of dust that even if they do not have time to settle on gears and bearings, nevertheless find their way into chambers usually considered tight. When mixed with oil or grease this dust forms a combination which acts as an abrasive, grinding away into even the hardest steel. To meet successfully this condition a good lubricant must retain its adhesiveness to metal in spite of the dust and dirt and must form a film on the metal of a thickness sufficient that the dust particles and grit absorbed are not simultaneously in contact with both rubbing surfaces or do not directly carry the pressure between these surfaces.

The problem then, is the obtaining of an oil which will not form hard adhesive carbon and still have a sufficiently high viscosity to act as a good lubricant. To meet these conditions and produce an oil with a fairly uniform distillation, the oil should be a filtered pure mineral product, flashing above 300 degrees, and it would seem that by the filtering out of many foreign or precipitated substances a fairly low carbon residue would be assured.

Oil—Always A Safe Remedy

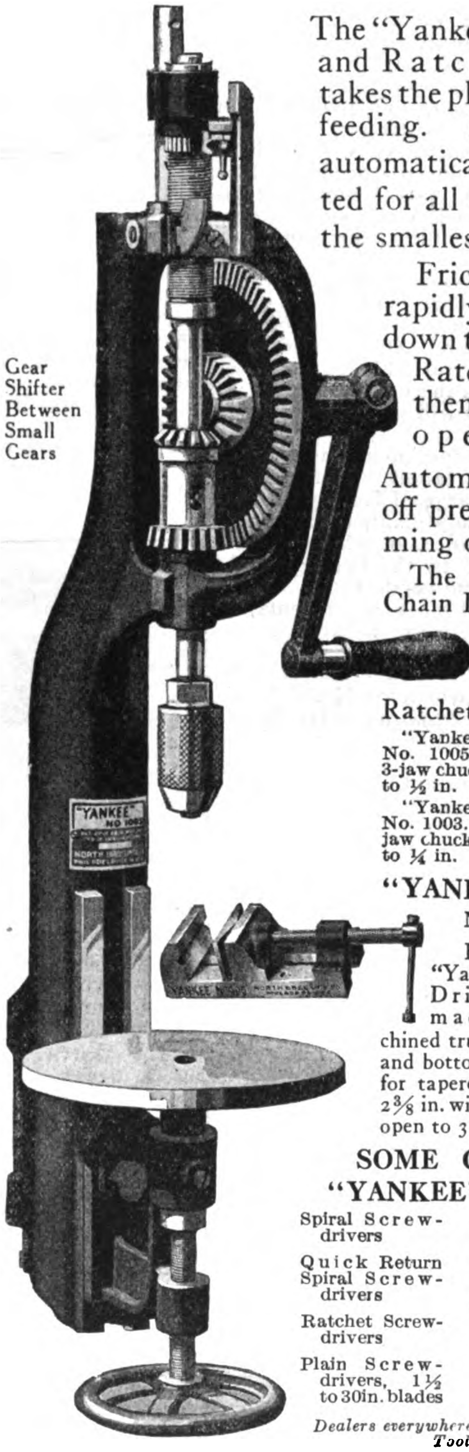
At any rate as it is now when you are out on the road miles from anywhere and your engine heats up, you may be calm. You may get out and look at the radiator and you find that the water level is all right, but look at your oil gage and that shows you where the trouble is. You grab your oil can, put the nozzle into the breather tube opening, pour in the contents with confidence, snap back the hood, sit down behind the wheel and drive on knowing that your engine is protected from friction and overheating. What more do you want?

* * * * *

Business is a game. Not a game of chance, but a game of skill. Play it with all your might—with all your strength, but play it fair.

People who go after nothing generally get what they go after.

For speeding up work and saving drills



The "Yankee" Friction and Ratchet Feed takes the place of hand feeding. Pressure is automatically regulated for all drills from the smallest up.

Friction feed rapidly runs drill down to the work. Ratchet feed then goes into operation.

Automatic throw-off prevents jamming of gears.

The "Yankee" Chain Drill has the same Automatic Friction and Ratchet Feed.

"Yankee" Bench Drill No. 1005. Two speeds; 3-jaw chuck, holds drills up to ½ in. Height 28 in.

"Yankee" Bench Drill No. 1003. One speed; 3-jaw chuck, holds drills up to ¼ in. Height 18¾ in.

"YANKEE" VISE

No. 990

For use on "Yankee" Bench Drills and other machines. Machined true on ends, sides and bottom. Swivel jaw for tapered work. Jaws 2⅜ in. wide, 1⅜ in. deep; open to 3 in.

SOME OTHER "YANKEE" TOOLS

Spiral Screw-drivers	Ratchet Breast Drills
Quick Return Spiral Screw-drivers	Ratchet Hand Drills
Ratchet Screw-drivers	Ratchet Chain Drills
Plain Screw-drivers, 1½ to 30in. blades	Automatic Push Drills
	Ratchet Tap Wrenches

Dealers everywhere sell "Yankee" Tools.

This Book Mailed Free

Write today for this helpful book. Contains over a hundred illustrations showing tools in use and "Yankee" Tools of interest to the automobile repairer.

NORTH BROS. MFG. CO., Philadelphia

"YANKEE" TOOLS

Make Better Mechanics

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The New Eveready

Despite a sluggish market and general business conditions far from ideal, distribution on the new Eveready Spotlights, "the flashlight with the 300-foot range," is proceeding at a rapid rate, according to officials of the American Eveready Works, Long Island City, N. Y.

These Spotlights were announced to the trade on May 1, and already their sale has equalled the factory's capacity of production on these types. "We have never before introduced a product which has met with such instantaneous acceptance," says Emmet Moore, assistant general sales manager of the American Eveready Works.

"The Spotlight is essentially an outdoor light," says Mr. Moore, "and we are offering it to the trade just at the beginning of the vacation season. All our consumer advertising will feature this Spotlight for vacation uses, and the dealer who stocks the new types now will surely find a ready market for them."

An interesting experiment was recently conducted by Mr. Moore and Mr. R. A. Wentworth, in charge of factory production at the Eveready plant, to determine the greatest distance at which objects could be "spotted" by the Spotlight. At 300 feet Mr. Wentworth could readily distinguish Mr. Moore's movements; at about 400 feet his white collar could be seen in the Spotlight's rays. At even greater distances it was found that although Mr. Wentworth could not "find" Mr. Moore with the Spotlight, Mr. Moore was able to pick a path with the aid of the light thrown.

One very important feature of this flashlight is the small and compact "head" which permits the Spotlight to be inserted in the side pocket of an automobile. The extra Eveready Mazda lamps carried in the end cap container is a feature which will appeal to dealers and consumers alike, because of its simplicity, practicability and convenience. No more will the burned out lamp put a flashlight out of commission, for simply by unscrewing the bottom cap another lamp will be found ready for instant use.

Tirometer Heavy Touring Tube

A new tube is being placed on the market by Currie Brothers Company, Inc., of Atlanta, Ga. The tube, itself is a pure gum tube, full laminated construction with special preservative, which is said to assure endurance and resistance against heat. Instead of the ordinary air valve, however, the tube is equipped with a Tirometer which is not only an air valve but is also an air pressure gauge.

The Tirometer is guaranteed to be mechanically perfect and register the air pressure with absolute accuracy. It has a practically unbreakable, transparent dust cap that does not interfere with the instant reading of the air pressure in the casing.

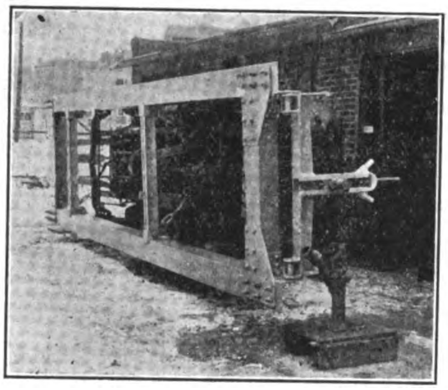
The new tube is called the Tirometer Heavy Touring Tube and is made in both red and gray. Each tube comes complete for any type of wheel.

It is claimed that under-inflation is responsible for ninety per cent of premature tire troubles and lessens the life of a casing at least a third. It is undisputed that the average car owner does not take his air pressure half frequently enough but with Tirometer Heavy Touring Tubes it requires no effort to tell what the exact air pressure is in every tire on the car, for just a glance tells the exact air pressure in the casing.

Tirometer Heavy Touring Tubes are now in quantity production on all sizes and deliveries are being made.

The Morrison Auto Cradle

It is generally conceded by repair men that the modern engine stand with its turning features is a practical and necessary tool in the service station. Such a machine has been found to pay for itself in a saving of time. If such a turning stand is practical for engine work, it is to be assumed that the idea is applicable to a larger field. This is the mechanical idea embodied in the Morrison Auto Cradle which is made by the Morrison Corporation with offices in the Apollo Building at Pittsburgh, Pa.



The Morrison Auto Cradle comprises of a heavy steel frame, suitably reinforced and fitted with quick-acting clamping irons with turnbuckles. At each end is a heavy casting which carries a sliding, center journal which may be adjusted at the center of gravity point of the device with car upon it.

The car is first driven upon the steel cradle and then clamped down securely. A heavy jack is then placed at each end of the cradle beneath the adjustable steel journals and the whole assemble raised clear from the ground. In this position the cradle with the car may be turned to practically any angle for work upon the running gear or upon the underneath parts of the car.

New Pacific Coast Representative

The Mueller Electric Company of Cleveland, Ohio, manufacturers of Universal Battery and Test Clips, has appointed Mr. Harry E. Marshall as Pacific Coast representative with offices and warehouse at 332 Leavenworth Street, San Francisco, Calif.

A local stock of all types and styles of Battery Clips will thus be available for customers on the Pacific Coast.

Piston Ring Service

With the opening of the Gill Piston Ring Company at Buffalo, New York, the Gill Manufacturing Company now has a line-up of 39 stores throughout the United States for the convenience of every class of trade using Piston Rings.

A minimum stock of 15,000 rings, both standard and over-size in width and diameter, to fit practically any cylinder or piston which is in use today, is carried at all Gill Branch Stores.

The 39 Gill Branch stores are therefore able to carry out their well advertised policy of giving twenty-four hour service on practically any size or oversize Piston Ring in any part of the United States or Canada today.

The Gill Manufacturing Company of Chicago, maintain a surplus stock of over one million piston rings at all times, from which the service stocks at various branches are constantly replenished.

Many dealers and repair men find it both convenient and profitable to carry 72 to 144 Gill Rings in stock on their shelves at all times, in order to quickly handle repair jobs on those cars which predominate in their locality. Indeed, a great many repair shops which specialize in the overhauling of a particular make of car, will frequently stock three hundred or five hundred Gill Piston Rings, carrying 250 rings of standard size—one hundred rings which are .015, and fifty rings which are .031.

Interesting discounts are offered by the manufacturers on such stocks and sizes are exchangeable at any time. Full details of prices and discounts can be secured by addressing the Gill Piston Ring Company, 8300 South Chicago Avenue, Chicago, Illinois, on cases where the Gill Manufacturing Company has no jobbing accounts in your vicinity.

C and T Adjustable Aligning Reamer

Repairers the nation over will be interested in the advertisement of Chadwick & Trefethen of Portsmouth, N. H., in this month's issue, which shows trade number, dimensions and prices on their new Piston Pin Aligning Reamer.

For some years the trade have demanded an adjustable reamer with an **adjustable** pilot. Reamers with changeable pilots are not novel but we believe that these well-known manufacturers are the first to produce a practical expanding guide, or pilot, that could be calipered and set to the desired size.

The blades are ground and adjust on the well known genuine Critchley principle. Extra blades are obtainable, it not being necessary to buy the full set of six blades if one is broken.

The pilot consists of three segments that find their adjustment on grooves that are distinct from the groove that adjusts the blades. The three sectors that form the guide are said to be indestructible and will outlive the reamer.

A feature that appeals to all repair men is that one of these Reamers will do the work of eight old-style solid guide reamers. It would seem that Chadwick & Trefethen have solved the problem of adjustable pilot reamers used where alignment is an absolute necessity.

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The Ray Battery

The Ray Battery Company, formerly of Detroit, is now in its big new plant in Ypsilanti, Michigan.

The battery being produced in the new factory contains the "Lavier Formula" plates. It is claimed by the factory that, by unusual chemical and manufacturing processes these plates are given a very high porosity, yet a more than usual toughness. By this formula the makers have endeavored to minimize harmful sulphation, plate breakage and washing down, yet increase the efficiency of the battery by high porosity.

If the guarantee is indication, they have succeeded in their purpose. This battery is guaranteed for two years without conditions. The guarantee covers the owner against any defects for two years' time. It is only necessary to return the battery for replacement with a new one, no adjustments being called for.

These plates are the creation of Thomas Lavier, Vice-President and Chief Engineer of the Ray Battery Company, long identified with the engineering end of the battery business. The president of the company is Roy R. Fisher, President of the Fisher Tool & Supply Co. Daniel B. Jacobs is Sales Manager.

Growth of Hecht's Magneto Exchange

The Hecht's Magneto Exchange, which was located at 230 West 49th Street, since 1910, where the present owner had started business at first on a small scale in one part of the building, later developing and expanding his business to the extent of occupying the entire building, has now on account of inadequate location and space, built its own building at 210 West 54th Street, foot of Broadway. This is a modern marble building.

It is built for the purpose and convenience of their patrons and the ground floor consists of a garage where repairs are made and prompt service is rendered for motor cars and motor trucks. This garage is specially equipped for this purpose with several different testing apparatus and special devices, the only garage or workshop of its kind in the country.

The company's workshop is equipped with the most efficient and scientific testing apparatus for the thorough and efficient repair work of Magnetos, Generators, Self Starters, and Coil Units, in which the company has specialized since their inception in business. This apparatus has often been copied by friends in the same line, also by the Army for field service on their motor trucks and motor cars.

H. G. Paro Announcement

The H. G. Paro Company of 1412 South Michigan Blvd., Chicago, Ill., announces that they have purchased the entire stock and patents of the Grease Pump Mfg. Co., and that the consolidated organization will hereafter be known as the H. G. Paro Company.

This company will endeavor to manufacture the very highest grade of grease guns in line with their other products.

A New Application of the Moore Transmission Unit

The war department of our Government has recently conducted a series of experiments with tractors and tractor attachments with the idea of finding a machine which could be driven over practically any kind of ground from mud to macadam. The tractor units are too large and heavy for troop transportation, as well as too costly for dispatch work.

A recent test was made in which a Ford car was fitted with a Moore transmission unit, manufactured by the Tractor Train Company, 1344 Wall St., Los Los Angeles, Cal., which as our readers know, is an auxiliary transmission. This unit, when applied to the Ford car and used in conjunction with the regular Ford transmission, gives a great number of gear speeds and a proportional increase in power, thus increasing the speed range from a point below the ordinary low speed, to a point equal to the regular Ford high speed.

In addition to this unit, the Government fitted an endless belt over the front and rear wheels, providing a caterpillar action for the car. As supports for the center of the belt two additional wheels were mounted between the front and rear wheels ordinarily used.

The machine thus equipped was tested over the same ground that the regular 80-ton army tank negotiated and it passed the test easily, passing through fields of mud, over steep embankments, across ditches and through stubble. On ordinary roads the machine developed a speed of as high as 35 miles an hour.

IF YOU WANT THE DEPENDABLE KIND OF

DIFFERENTIAL AND TRANSMISSION

GEARS and SPROCKETS

That can be relied upon to be accurately machined, and of the highest grade material. Send us your samples.

Write for prices and terms to

WILLIAM GANSCHOW CO.

Morgan and Washington Blvd., Chicago. Ill

APRIL SIXTH, 1921

Automobile Dealer & Repairer,
71 Murray St.,
City.

Gentlemen:

We have used your publication rather extensively within the past few years, more so last year than before, and the results of our advertisements therein, have been very satisfactory to us.

The inquiries run a much higher percentage of your circulation than many of the other publications we use.

Very truly yours,
J. H. FAW
For Fawsco Wrench Co.

BAYLEY'S AUTOMATIC

INSULATED SPARK PLUG TERMINAL

For Automobiles — Motorcycles —Motorboats—Aeroplanes

Instantly connected—instantly disconnected. "The Button does it!" Forms a rigid contact. The spring locks it! Attached by hand—no tools needed. Transmits a stronger spark — gives added power. Prevents short circuits, shocks and burnt fingers. Practical—time saving — economical. Highest quality. To introduce them we will give 4 B. A. T. Terminals for $1.50 with a money-back guarantee if not satisfied. Jobbers and Dealers write for proposition.

"When Ordering State the Type of Spark Plug You Are Using."

B. A. T. Terminal Co.

105 Vanderveer St., Brooklyn, N. Y.

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A NEW MARKO DISCOVERY

The most wonderful improvement in Storage Batteries in years.

RADIUM TREATED

Insuring MUCH LONGER LIFE and greater capacity, with a REAL TWO-YEAR GUARANTEE—no adjustment plan.
The result of 14 years' experience in battery manufacturing.

Ready for immediate delivery

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Main Office and Works:

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COMPLETE TIRE REPAIR OUTFITS

$155 Boiler Gas

Free instructions with outfit. Write for 108 page catalog listing complete Tire Shop Outfits.

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"LESS COST"

COMPLETE CURE ONE HEAT

Makes any repair 2½ to 5½ inch Tires

Boiler Gas \$157. Gasoline \$168. Steam Line \$129

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ALL IN ONE

CHAS. E. MILLER

(Sales Dept) Anderson Rubber Works
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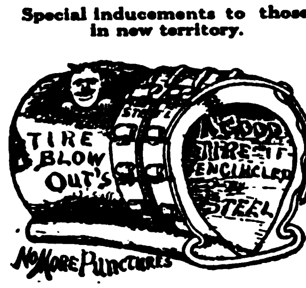
Hang on to your old tires. They will last as long as you live if covered with steel. The Kimball Steel Protector makes Blowouts, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires as flexible as ever.

Special inducements to those in new territory.



MUD CHAIN can be put on in a jiffy with one hand while standing on the run board: If you get in a mud hole you will laugh out loud. Hook the ends together and pull the little lever and they are on tight. Good for blowouts.

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SHEET PACKING

MANUFACTURED FOR ONE PURPOSE

TO MAKE TIGHT OIL, GASOLINE and WATER CONNECTIONS

TOUGH

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DURABLE

Gaskets easily fashioned—no shellac required. Not only makes tight joints but the joints stay tight after hard usage. With service the aim of all repair men, is it advisable to use poor gaskets that will soon leak, thereby risking one's reputation on an otherwise well done job? The difference in price between a good and poor gasket is infinitesimal. Let us help you in this matter! If your jobber does not handle VELLUMOID write to us.

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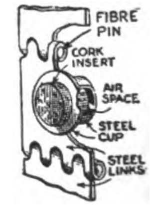
IT RUNS SLACK—Do you realize the importance of this feature? All strain taken off the fan bearings. Fits any Ford Model or other makes of cars, trucks or tractors.

We offer a set of "Kork-Tred" Ford Transmission Lining. \$3 per set, and a K-T Fan Belt, \$1 for the price of a Set of lining. This makes the belt a gift. Send in your order at once. Money refunded any time. Folders free. This offer good during month of May.

Special offer also to dealers and repairmen.



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Automobile Dealer and Repairer

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Buyers' Guide and Index to Advertisements, Pages 70 and 71 Table of Contents will be found on Page 72

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(by the makers of VULCAN Springs)

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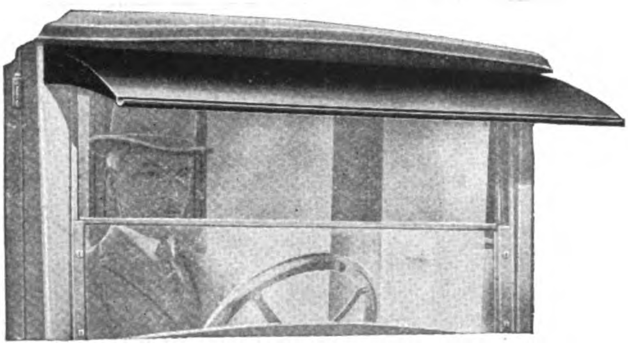


Type A, universal, fixed type for all closed cars with straight fronts.

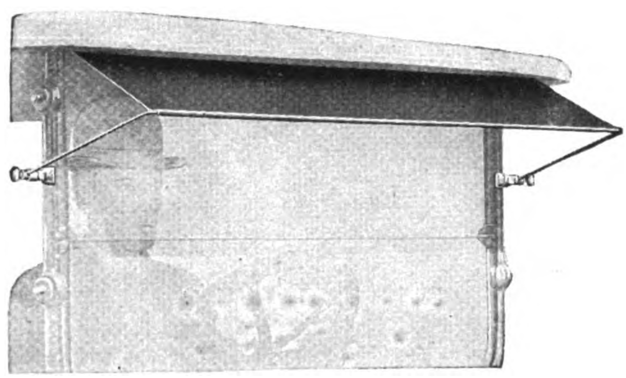
VULCAN VIZORS prove their value by their quality construction, conforming in every way to time-honored VULCAN standards; by their adaptability to any car; by their logical price based on present-day costs; and by their liberal profit to the dealer.

We know they are worth making and advertising. You will find them well worth selling.

Type A is a fixed vizor for all straight-front closed cars. It is easily attached, vibrationless, and merges into the lines of the car, improving its appearance.

Type B is adjustable, and fits all open cars. It folds into the top when top is lowered and can be adjusted to the driver's vision with two thumb nuts.

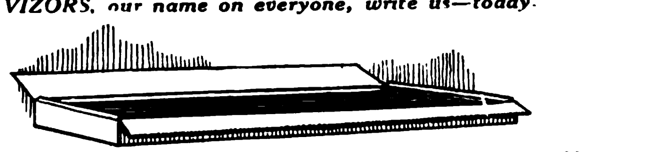
Type C is adjustable; similar to Type B, fits any closed car.



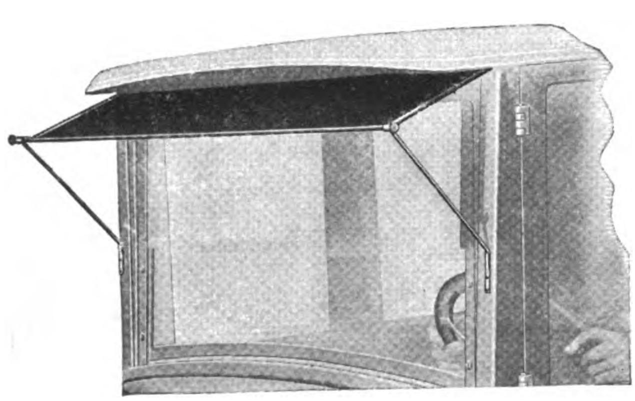
Type B, universal, adjustable type for all open cars.

VULCAN VIZORS are made of the very highest grade Armco automobile sheet steel, and are handsomely finished in baked black enamel of a special dull satin effect. We are marketing these vizors on a strict policy of satisfaction or no sale. There is a liberal discount to the dealer.

If your jobber cannot supply you with genuine VULCAN VIZORS, our name on everyone, write us—today.



Packed in individual corrugated fibre cartons, with necessary screws and simple instructions.



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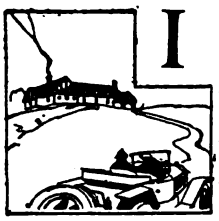
Automobile Dealer and Repairer
REGISTERED IN THE U. S. PATENT OFFICE
VOL. XXXI. No. 6 AUGUST, 1921 PRICE { 15c per copy / $1.50 per year }

When Car Meets Car

What the Various Cars Think of the Treatment Their Owners Give Them

By J. H. Moore



IT WAS the hour of rest, (if there be such an hour) in a certain public garage. It was close to 1 a. m. and most of the cars were in place under their respective numbers. The only sound to be heard was the hiss of a hose at the far end of the building, where the night attendant was washing up one of the machines. Truly it was a peaceful scene, until suddenly a little Ford, whose birth dated back to 1914, muttered impatiently "I can't sleep a darn wink for the noise of that blinking hose."

If a bomb had dropped into the midst of the near sleeping cars, it could have caused no greater stir, for once the ice was broken, a regular babel of voices answered "You said something, Henry."

It was a large Packard that eventually made his voice heard above the general din.

"From the tone of our remarks" he started ponderously "We all seem to take exception to the disturbing of our few slumber hours. Every night it is the same, and sometimes—yes, quite often in fact, I am the unlucky victim that suffers the hose."

"It's maddening I tell you, and something should be done. They imagine cars have no heart, no soul, no feeling,—but they have, and personally every time that cold water hits me I shiver to the bone. If they used luke warm water, they would accomplish more, and I would suffer less."

"But what can we do" chimed in a car to the right of the Packard. "Do—that's just it—what can we do?—*Nothing*. No one understands us. If our owners don't know enough to care for us during the day, how on earth can we hope for them to look after us at night? When all is said and done, we are better off here in this heated garage, than a lot of others, freezing in some private back yard shed. If owners only knew the damage they did to their cars by leaving them night after night in a cold garage, there would be more garage heaters sold, believe me."

The Ford Chatters

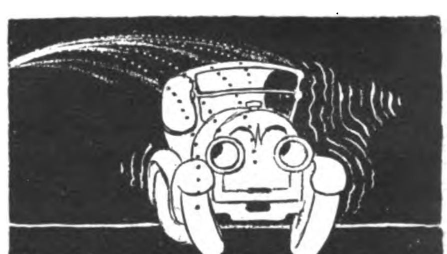
"Speaking of owners," began the little Ford who had started the fuss, "my boss put a funny one over on me today. For absolutely no reason whatever he retarded my spark lever, and of course I got quite heated up about it. I showed him so plainly, with the result that he called me a tempermental army mule, or something to that effect. To make things worse he let my oil get quite low, so judge for yourself how I acted. As luck would have it, we were over a mile from an oil station when I stopped. To be candid, he stopped me, I didn't seize on him, although I might have soon, if he hadn't taken the bull by the horns."

"He got out, looked me over, and said something to the effect that what the —— would he do with me now. He wasn't half as mad as I was, but still—I rather like my boss, so I tried to convey to him an idea I once saw him reading in his favorite automobile magazine. By a superhuman effort I got his attention.

"Remember," says I, "when the oil gets low, it's your own darn fault, but don't give up. Pour some water into my crank case. Oil and water won't mix. You're bound to have a little oil at the bottom, and remember *Oil Floats*. Some of it will be sure to reach my bearings.

Hard as it is to believe I got my thought across, with the result that I received some water. It wasn't pleasant —BUT—it was better than a scored cylinder, or some burned out bearings.

We got to an oil station all right, when he cleaned me out properly, but I couldn't help but laugh, when I



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heard him say to the garageman "Gosh, it was lucky I remembered the oil stunt. It's a long time since I read it, but a hint like that always sticks.

The Dodge Speaks

"Well now" began a Dodge, "that story reminds me of my boss, and how he is a bug on saving all kinds of hints for repairs. I often felt he was a little loose in his belfry, but the other day I took it all back. I had just run over a rotten piece of road, and one of my tires gave under the strain, with the result that I had a long, ugly tear in my inner tube. It looked to me like a walk for the boss, but not for him. He got out this book of his from one of my pockets and turned to "T." "Tires" he mutters, and then he smiled.

"The next thing he does is delve into the tool box and get out a needle and thread. Does the darn fool think sewing it up will hold in the air?" thinks I. But wait, he's not finished. He just sewed the tear enough to hold the edges together nicely, placed on the top patch, then used his small gasoline vulcanizer. Of course I now saw his idea. By so doing he kept the edges of the tear together and made a good job. There was quite a breeze blowing when he was doing the vulcanizing, and what does he do, but fish out a little collar about 4 inches high, and places this around the vulcanizer.

"The collar was made of about 4 ply of wire gauze, and was held together by a wire, woven through the mesh of the gauze. Of course he put this over the vulcanizer before he ignited the gasoline, and he thus avoided the burning of the tube. From then on, I became a real enthusiast for auto hints."

The Chevrolet's Story

It's funny the darn fool questions a boss will ask, "remarked a Chevrolet. "My owner asked the garageman this morning what temperature my battery would freeze at."

"Don't worry," says the fellow, "You keep your battery properly charged, and it's got to hit 90 degrees below zero before it will freeze. But remember this, let it get weak, and twenty below will do the deed.

"Thanks" said my boss, and then he adds "Say, I've quite a few old tires up home, are they good for anything? Casings I mean."

"Sure," said the garageman. "You're pulling your car out of here next week aren't you, to place it in your own private garage that's just about built." My boss nodded. "Well then," why not cut up one or two into about one-sixth of a circle, and use this as bumpers on the door posts. It will save the hinges, and judging by the way you hit mine occasionally, you'll need them. "Would you believe it" said my owner, looking at the garage doors, I never knew those were casings before. You've got them all painted up. Now that you speak of it I do remember hitting them once in a while, and I always wondered why they didn't mark the body of my car."

"Bosses are funny things sometimes" finished up the Chevrolet.

The Liberty's Tale

"Oh I don't know," commented a Liberty Six. "All owners are not alike. I have a boss that attends to me better than he does his wife. Laugh—Go on—Laugh—but it's a fact.

"Every morning he takes a nice smooth cloth, with just a suggestion of polish on it, and rubs me nice and gentle. Before he does that, however, he takes an oil can and oils me at every necessary part. He knows me like a book. I remember when he first bought me." "Remember this" says the salesman. "All cars need attention. *You* require food, etc., and they likewise need oil, grease, and so on. If all owners paid attention to these words, there would be less repair shops throughout the country."

He presented the boss with a chart of the parts to be oiled and greased, and away he went, but the boss sat down and studied me hours at a time. He used to sit down on a box and look me over one minute, and the chart the next, saying, "oil goes there, grease goes there, and so on."

"After he oils and greases me, he makes sure I have water in my radiator, and oil in my crankcase. He even makes sure the repair tools are in place. He trusts me,—yet likes to play safe. Last of all comes the cloth I already mentioned, and after he is through he stands back and say 'Boy, you're a beauty—just as good as the day you were bought.'

" 'Thanks to you' I says, but he never understands me.

"He never runs me through mud at high speed. He avoids ruts, puddles, and car tracks, with the result that my paint is just as good as new, and I am easy on tires.

" 'By George,' his friends often say, 'you've got some car there.'

"If I could only make them hear I'd tell them why I stand up better than the cars they own. I only wish the story I've told could get to car owners in general—maybe it would make them sit up and take notice."

After this story, there was a decided silence. No one seemed to have anything further to say. At last the Ford broke the silence, "Say, fellows, I heard a funny story today—want to hear it?"

Strange to say he received no answer. Suddenly it dawned on him why the other cars didn't reply. They were actually asleep.

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With a grunt to the effect that they were collectively a bunch of dubs and in considerable pieces of tin and gears he snoozed off himself, and was soon dreaming that he was equipped with 24 cylinders, and ran on hot air drawn out of space. He was away ahead of them all in his fancy, and as he dreamt on, he smiled a superior smile, that only a Ford can wear, and the funny story was held for a more convenient season.

On the Subject of Fords

By D. A. Hunter

WHEREVER machinery is in use, a word of caution is in order. Men in industrial lines have been educated to this thing by long intensive "safety first" campaigns but the man in the automobile and the man on the farm laughingly respond, "I guess what little machinery I come in contact with won't do any one harm." And yet there is more power in the automobile engine than is used to drive the machinery of thousands of small plants all over the country, and it is now an established fact that while industrial accidents of magnitude have become practically a thing of the past, accidents on the farm have increased by leaps and bounds—and these are often of the most distressing type and take place where the victim is miles from the nearest professional assistance and often when he is alone.

John Huber owned a place down near the Pennsylvania line. He had a Fordson which did his hauling, plowing, fodder cutting, wood sawing, and a few other services. John Huber was killed last year. He was cutting wood, driving his saw from the power take-off of the Fordson. There was no governor on the engine and he had the throttle wide open to hurry the sawing job to a finish; that didn't hurt the engine any nor the saw but it was entirely too fast for the balance wheel on the saw mandrel. This later burst from centrifugal force, and a piece killed the owner.

The machinery throughout was first class but the cast iron wheel had been speeded beyond both practical and theoretical limits and gave way. The owner did this through ignorance and carelessness. The moral to be drawn from this is "always get competent advice before operating every piece of machinery, no matter how innocent in appearance it may be."

* * *

Out in the western part of the State there is a fifty mile railroad, traversing a usual farming and woodland country, and connecting at each terminus with great trunk lines. A dozen villages of about a thousand inhabitants each dot the line but the road has no passenger service at all. There is one freight train a day each way. Except for a couple of short stretches, there are no improved roads parallel to the railroad, which means that during five or six months of the year the only way to penetrate this section is to charter a horse and wagon for a forty mile drive. And that in a settled region in this advanced age!

It was that way when we were there and we decided to forego the pleasure of a business trip into the interior. But how we wished that we had a set of railroad wheels to put on our old Ford, said Ford then to take its place as a piece of rolling stock and do thirty miles an hour over the fairly good roadbed. Why the managers of this railroad should be so short sighted, is strange to see. If they owned a number of Fords, they could give frequent service over a "road" that was never impassable—service that was speedy, cheap to maintain, and profitable; the cars could be equipped for less than $200 a piece, then if they wanted to they could construct or alter the bodies to increase the seating capacity as jitney men do. There is no danger of overloading because the rails offer practically no grades or bumps. Here is a case where smart hackmen would fight for the privilege of running a bus line, if there were passable roads, yet a railroad management calmly blinds its eyes to the business that begs for attention.

* * *

Wander through the residential section of a small town in the evening and you will find many a friendly spirit at work in a private garage. Near Ramapo, New York, a middle aged man was drilling holes in the frame of one of two Fords in the building. "I'm a truckman, in a small way, and I'm making a carrying frame to hold long pieces on the side. I like to tinker around cars—I buy up old cars, put in new parts, and sell 'em—just for the pleasure of working on them."

He was drilling with flat, or "farmer," drills which he had made himself, heating them in his furnace fire in the Winter and forging them to shape on a piece of old rail. Fig. 2 shows such a drill. This type is really better

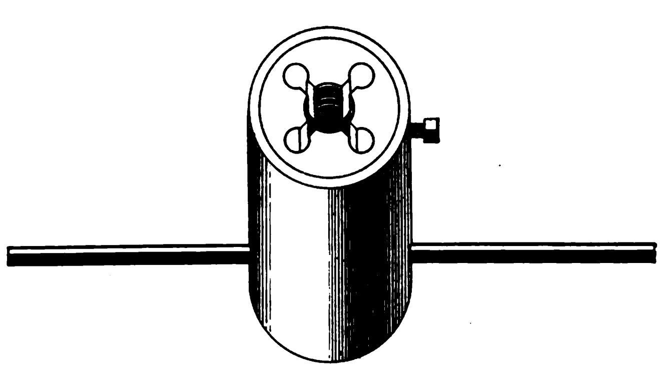

Fig. 1.

for hand drilling in thin pieces such as frames and sheet metal parts—because it has not the spiral cut of the twist drill, it has no tendency to pull in and tear. Like the

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truckman, anyone can make up a very fair set of drills in spare time in just this way.

"I'll show you what I use for spring clips," said our friend. "I go to the Ford agency and they give me any number of old clips that have been thrown away because

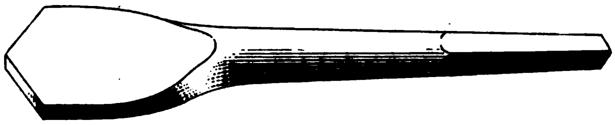


Fig. 2.

of battered threads. Most men spoil a tight clip getting it out. Then the ordinary die stock cannot re-thread them and they are discarded as worthless. I took a short piece of 1¼-inch pipe, which is just about right inside for standard round dies, put a set screw in one end and a handle in the other. It makes an extension die stock that will re-thread any clip without its going through a couple of heating processes." Fig. 1 shows this tool, which may well find a place in every home workshop.

* * *

Experience is a good teacher. Experience with garages teaches the car owner to look around before he places an order for work on his car. We were browsing around in one garage while a tire was being changed. That's the last job they will ever get on our car. A grimy workman stood on the frame of a Ford car, straddling the engine and perspiring like a refrigerator on a summer's day. He was bearing with all his weight, on a carpenter's brace with a screw driver bit in it, turning it round and round "grinding" a valve, and with not even a spring under it!

* * *

The Erie railroad does not pose as a friend to motorists but a section gang did a car owner a kind act the other day. The motorist had run into the abutment of the bridge where the road crosses the Erie near Howells and he had bent his front axle. Seeing the track gang nearby, he blocked up the front end and took the axle out. This he carried down to the track, asked the Irish foreman if he had a good "striker" in the bunch and if he could help him a few minutes. Plenty of skilled help was offered and by holding the axle in proper position on the rail and directing the blows, the axle was quickly straightened. Laying it on the rail in two positions, it was possible to line it up very correctly with the aid of the foreman's two foot rule.

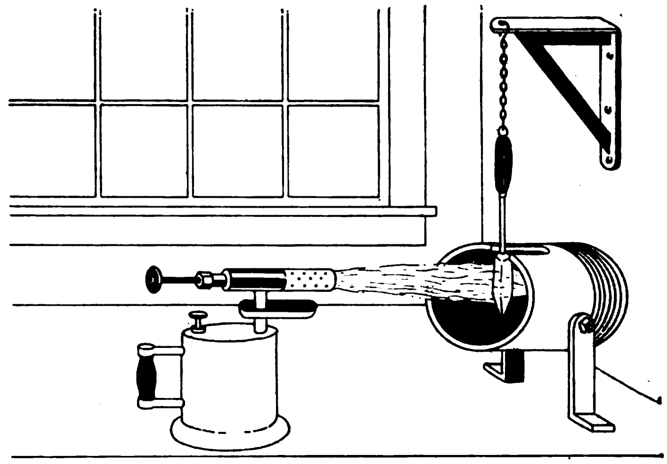
Every true Ford article must include the rattle. But why a rattling Ford any more than a rattling Moon? The secret of the whole thing is in attention. The Moon and the Rolls-Royce would do the same thing if neglected in the same painstaking manner and banged over the same roads in the same heroic way. Any owner who will take half an hour a week to go systematically over his Ford will beat the rattle at its own game. One week cover the running gear, the next week the engine and transmission, and the third the body and its fixtures. Try every nut and bolt, take hold of each rod and fender and give them a vigorous shake, stand on the running board and jounce up and down.

If you ride a lot, this will cure the rattle at its source, if you don't ride much, take the treatment in less frequent doses with the same result—whichever way this bromide is absorbed, it is guaranteed soothing to the nerves of the owner while adding youthfulness to the car.

SOLDERING IRON HEATER

By Chas. H. Willey

FROM an old piston of a gas engine or automobile engine, a very useful furnace can be made by cutting



An Easily Made Soldering Iron Heater

out a small section of the skirt, as shown in the sketch, and securing it to the bench by two brackets.

A shelf bracket and a piece of chain completes the heater, as shown in the sketch. All the heat of the gas torch is conserved in the furnace for the heating of the copper.

WE'VE TRIED IT

The time to buy a used car is just before you move, so people in the new neighborhood will think you were the one who used it.—*Kansas City Star.*

Once in a while there is an old way of doing things that is better than the new ways, but don't let that be the means of tying you up to a whole lot of antiquated methods.

There is this to be said in favor of good intentions though they never be carried out, they make one feel good.

Study briefly the face of the fellow who is carrying a fishpole and you can tell whether he is coming or going.

The man who tries to live on his past reputation will soon go to seed.

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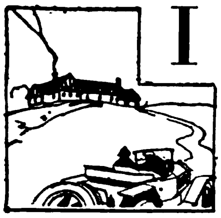
Some Pointers on Driving

Two Questions Which Frequently Trouble the Driver Answered

By Frank L. Almy



I have been asked, so often, two questions relative to driving that I feel an article on this subject would not come amiss. The first question is: "Is it good practice to apply my brake, to check the car speed, while the clutch is still engaged?" The second question: "Does it wear the clutch throw-out collar, to a great extent, if I make a practice of throwing out the clutch to coast down hill?" Although there are exceptions the general answer to the first question is "No" and to the second, "Yes."

The primal use of the brake is to check the speed of the car and if the operator applies the brake it is for that purpose. The engine is a unit for driving the car and its action is exactly opposite from that of the brake. This being the case it is obvious that the two forces are acting against each other when applied at the same time.

Unfortunately forces cannot be controlled by the mind of the operator, they are exacting in that they follow well defined rules. The operator may wish to stop the car quickly and apply the brakes, he may leave the clutch engaged and *wish* that the engine would help to check the car speed, but the engine follows but one rule and keeps plugging along and trying to pull the car along with it.

I am aware that this unsupported statement seems to controvert a previous article which appeared in this magazine to the effect that one should use the engine as a brake, but it does not as you will soon see.

An Illustration

For purposes of illustration we will assume that the car is running at a 15 mile per hour rate and an emergency calls for a drop in the speed to four miles per hour. At the 15 mile rate the engine is running some 1000 or more revolutions per minute and the power is being carried, to a great extent, in the flywheel. The momentum of the flywheel, in other words, is a force to be reckoned with.

The first motion of the driver is to cut off the gas which results in a "coasting" action in the engine. The engine will gradually lose speed but the rate of the loss will depend upon the size and weight of the flywheel. Normally it will be several seconds before the engine speed is retarded to the four mile per hour rate.

The brakes on the car, however, have a more rapid action and under average conditions the retardation of the car speed is more rapid than that of the engine. In many cases the engine cannot be retarded to a four mile per hour rate without skipping.

It must be obvious that if the clutch remains engaged, during this period of retardation, the brakes will need to check both the speed of the car and the momentum of the flywheel.

In this case we have assumed that the driver wishes to check the car speed as rapidly as possible. If, however, the time element does not enter and the driver simply wishes to slow the car within a few minutes, it *might* be advisable to apply the brakes with the clutch engaged; but why do this? The brakes will accomplish the same thing without the engine.

The drop in engine speed, after the throttle is closed, follows a certain law and a certain amount of time must elapse, under all conditions, before the speed drops from 1000 to 500 revolutions per minute. If the rate of retardation needs be increased, then an outside force is necessary.

Applying the Brakes

If, when you wish to slow down your car, you find that the closing of the throttle is not sufficient, then throw out the clutch and apply the brakes. The only time when it is advisable to leave the clutch and gears in and apply the brake is when the ignition is cut off and the engine is not operating under its power. This might often happen on a steep hill.

Our second question, which might seem rather unimportant, really deserves careful consideration. The clutch throw-out collar and thrust bearing which carries the strain are vital units in the car. Can you imagine what would happen to you if you were suddenly called upon to stop the car to avoid an accident and found that you could no throw out the clutch? If given sufficient time you might throw off the ignition, but every second counts and you can't be expected to think of mechanics when you are facing possible death.

A worn clutch throw-out member may jam or break and then you have no immediate means to disconnect the engine from the wheels. Therefore keep the throw-out mechanism in order, relieve it from all unnecessary strains and wear.

There are but two ways to coast down a hill, either with the engine connected with the wheels and acting as a brake or dis-connected by bringing the gears to neutral.

In a previous article we considered the first alternative, the use of the engine as a brake. Where the driver cannot see the bottom of the hill or is not familiar with the road, he should always leave the gears in either second or high and if the hill is steep the car can be controlled fully by cutting off the ignition.

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If, however, the driver is entirely familiar with the road and knows that there are no steep declines which might strain the braking system, then he is justified in setting the gears at neutral and coasting down.

The matter of getting back into a speed, at the bottom of the grade, is often puzzling, but with a little practice there should be little trouble. This subject was considered in a previous article.

Straightening Ford Crankshafts

Directions Which the Car Owner or Experienced Repairman Can Follow

By Donald A. Hampson
Member A. S. M. E.

IF the writer were asked to straighten the crankshaft of a "Six," he would gently advise the owner to take it elsewhere. The amount of labor involved and the uncertainties of the job make the work undesirable for any mechanic and unsatisfactory to the owner of the shaft. Good workmen with good tools have spent a whole day putting a six in shape, even when the bend was slight; the number of "throws" make a very springy piece and one which is hard to straighten without putting in reverse bends, while the fact that the pins are 120 degrees apart make the shaft exceedingly hard to properly support for pressure at the bent spot. An owner can hardly be blamed for balking at a big bill for straightening a shaft that was "out *only* a sixty-fourth," but it is well known among mechanical men that doubling the accuracy quadruples the cost of work and so it is that getting out the last few thousandths of bend requires hours of patient, careful work.

But it is different with a four. The throws all lie in one plane, which offers the workman a piece that may be readily blocked and pressed; the shaft is relatively short and stiff; and the main bearings are fairly close together. Ford crankshafts are particularly easy to straighten, though the method is the same whether it is a Ford or a Mercer.

Bend Often Unnoticed

A crankshaft may be bent and no one ever know it until it is taken out. Then, it may be noticed when it comes to scraping in the main bearings or it may be put in a lathe for a little smoothing up and the bend noticed then. While yet in the car, symptoms of a bent crankshaft are flywheel running out of true, knocks not otherwise accounted for, main or rod bearings that cannot be kept tight or that heat up badly, and end play that is not traced to other sources.

The causes of bent crankshafts are many. A bad accident would undoubtedly damage the crankshaft if the blow got in as far as the engine; in that case, you would expect the bend and look for it purposely. But the average bend is the one where you suspect it but continue to run or where you don't suspect it but accidentally discover the trouble when the engine is down. When a crankshaft is forged, and during subsequent processes, certain stresses are set up in the steel which forever remain though these are relieved and balanced as much as it is in human power to do so, to the end that the shaft is perfectly true at the time it is sent out; the seasoning of time coupled with the pounding of daily service sometimes further relieve the stress remaining, but unevenly, and the shaft bends slightly though it is confined by the main bearings and the bend remains undiscovered until the engine is taken apart.

Running with loose bearing caps will cause a bend in some cases and the same is true of bearings that wear large and are not attended to. Some accident which causes a connecting rod to get loose from its crank pin will almost surely bend the shaft, as well as do plenty of other damage. Lack of oil and cut bearings, crank pins worn out of round—these are other sources, and the writer has known instances where the wheels got into depressions in the road so far that the flywheel struck stones with the full force of the weight of the car and this bent the flange end of the shaft.

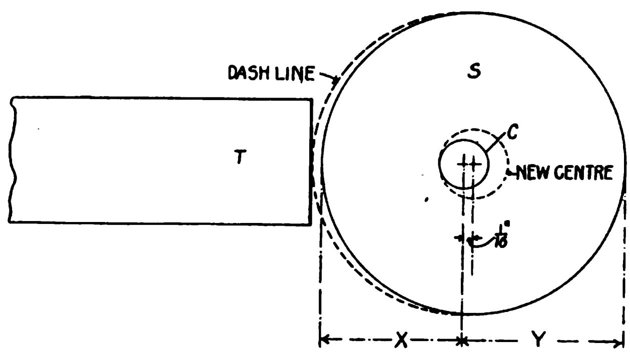

Fig. 1.

However, an ordinary service bend is not as serious as may appear to the owner experiencing it for the first time—in fact, if the writer were given his choice of straightening a Ford crankshaft or grinding in the valves of the critter, he would accept the former and practically guarantee to finish ahead of the man with the emery and oil.

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There is no good way to test the truth of a shaft except upon centers. In shops, this is done by placing the shaft between the centers of a lathe, spinning it around, and while it is revolving bringing a stationary piece close to each journal in turn as a means of comparison. In Fig. 1, S is the journal of a crankshaft and T is a tool or other stationary piece brought in proximity to the part being tested. It is worth stating here, that the term "bearing" is rather loosely used by automobile mechanics—strictly speaking, a "bearing" is a member that surrounds a revolving part while that portion of the *shaft* that revolves in the bearing is a "journal" though it is incorrectly referred to as a "bearing."

In both ends of the Ford crankshaft will be found center holes. The journals are turned and ground from these centers as working points, so it is always necessary to go back to them in checking up. First, they must be scraped and wiped free of all dirt. Then, if there is a bruise or punch mark that has forced the metal bulgingly in the center hole, this must be carefully scraped out making the taper hole as nearly round as the hand will permit.

When both centers are clean, place the shaft in the lathe, put oil on both centers, and set the tailstock center so the shaft can be spun around but held without looseness. Then put a tool, reversed, in the tool post or use a piece of bar stock instead and run this up near one of the end journals. The first thing to do in any straightening job is to find if the centers are true, or concentric. Aside from bruises in the countersunk holes, there is no good reason for centers getting out, but they do just the same, and he who neglects to try the end journals first is building upon a false foundation.

Referring to Fig. 1, C is the countersunk center in the end of a shaft. It is purposely placed a full sixteenth off to more clearly illustrate the point—in actual service, it probably would never exceed .004 of an inch or .005 of an inch. Because it is off center, the distance X is less than Y and, as the shaft revolves about C, the path that the high part Y makes as it revolves is that shown by the

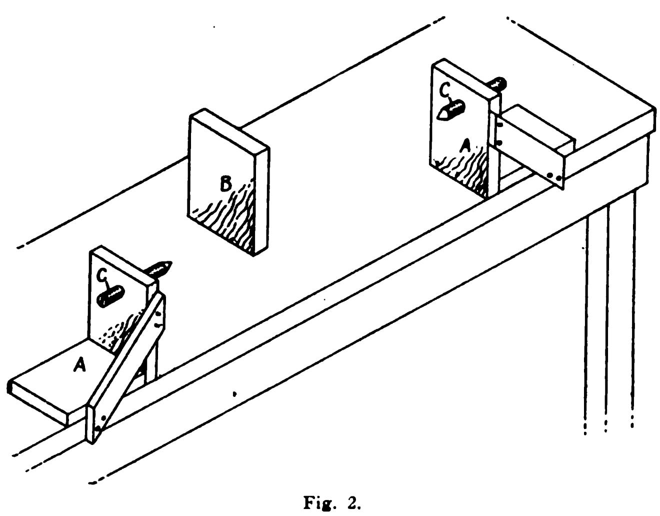

Fig. 2.

dash line. Once in every revolution it touches T which has been brought up as noted in the last paragraph. T is always set by trial and set so that it just touches—no more—when it will leave a bright mark on the journal, say, about an eighth long.

Before the testing can proceed, the error of the center must be corrected. The center hole must be scraped out by hand until it is concentric with the journal. A three cornered or half round scraper with a fine point is used for this work, which is often the slowest part of the straightening job. The object is to create a new center (necessarily larger than the old one) true with the outside and this new center must not be lop-sided but round, which means that you have to scrape a complete circle, increasing from nothing at one side to considerable at the

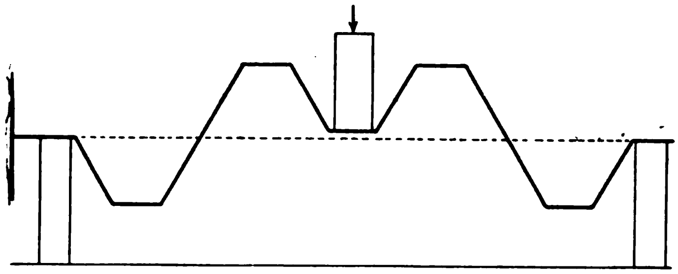

Fig. 3.

side opposite, that being the side where the lathe tool made the shiny mark.

The new center thus made is shown by the datted circle in Fig. 1. It is necessary to remove the shaft from the lathe every time it is scraped and to put it back again for fresh trials. After one end is finished, the same process is gone through with on the other if it needs it. It is better to do this on "dead centers," that is, not to run the lathe, for in this way any inaccuracy of the lathe spindle and head center will not affect the testing.

Frequently a person brings a crankshaft to the shop with instructions to straighten it, concluding that it was bent because he has revolved it on some sort of centers and noted that the end journals were out and, not understanding the principle, has concluded that the entire shaft needed going over. Centers "off" are not an indication of a bent shaft—centers are a means to an end and they afford practically the only means of properly testing a Ford crankshaft. It is for this reason that the matter, which is little understood by laymen, has been dwelt upon at length. Quite often, after the centers are corrected, it is found that the middle journal is all right and that the shaft is ready to put back in the car. A skilled man will generally take from one-third to one-half as much time correcting centers as he will in taking out a bend.

Instructions for the Car Owner

The man who "overhauls his own" can test his crankshaft and straighten it, even though he be hundreds of miles from a shop. (Not that this is recommended as the best way, but it *is* possible under circumstances and for those who like to delve into mechanics). There are thousands of small lathes in the hands of home mechanics; one of them that will take a 6-inch round piece will swing a Ford crankshaft and no better tool could be wished for testing the same.

In lieu of a lathe, very satisfactory centers can be built up out of wood as we show in Fig. 2. Angle pieces A,

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are nailed to the face of the work bench or to a 1½-inch board. In the upright part of these, holes are laid out the same and bored and through these places pointed set screws C are run, allowing the screw to force its own way through to insure a good thread. The cone shaped ends of the screws become the centers upon which the shaft is tried. A block B having a clean smooth edge is used as a tester; after the shaft is in place, B is brought nearer and nearer as the shaft is turned until it touches the high side of whatever journal is being tested. The position where it touches should be chalked for identification a little later. If the rig has been well made, the test can be made as accurately here as in a lathe.

Fig. 3 illustrates the private owner's method of straightening out a bend. Here the shaft is represented by the skeleton center line, and it is assumed that the bend is at the middle of the shaft. Hard wood blocks are set under the end journals, another is used in the center and is held by an assistant, while the blow is struck with a heavy hammer. The best plan is always to start with light blows, then to increase the force of the blows if trials show that no impression has been made. Regardless of the manner of straightening, it is necessary to test the shaft after each attempt—often, too much force is applied and the shaft gets worse before it gets better—that is why it is advisable to start with light blows for it is really better to go a little at a time than to overdo the thing.

Straightening is a task that requires patience; this and a knowledge of the principles enables the man with crude tools to do better work than he who has every appliance but lacks temperament. The press is, of course, the most approved tool for doing crankshaft work in the shop though the method of Fig. 3 is followed successfully in plenty of establishments. The writer has seen shafts bolted to the bed of a planer with part of the shaft overhanging and on this overhanging part a man was driv-

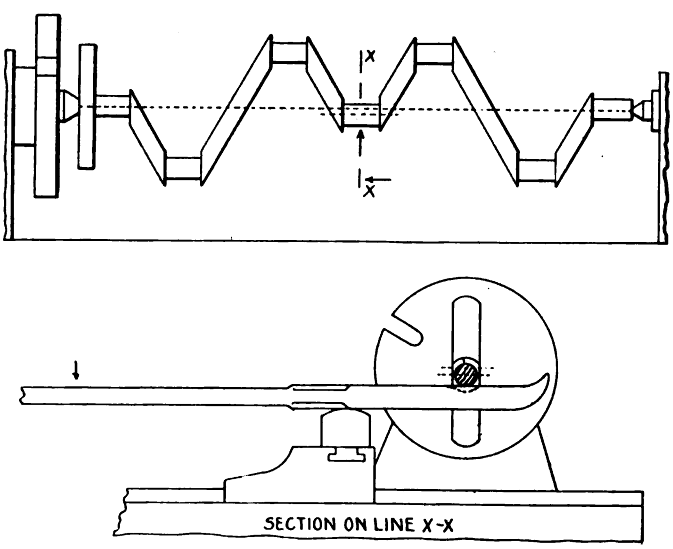

Fig. 4.

ing—a case of this kind requires the bend to be placed *down* instead of *up* as with other arrangements. In Fig. 3, the proposition is to bring the middle journal down until it coincides with the true center line shown below it.

An excellent plan is followed in some machine shops of keeping a lathe for rough work and hard usage, this machine being kept in the place solely for odd jobs of this class. Such a machine is just the tool to use for crankshaft work as Fig. 4 shows. Our Ford crankshaft is seen in position on the ecnters in the front view of the lathe. The center bearing—no, "journal"—is found to be out and when turned as shown, it must be pressed upwards in the attempt to straighten. The end journals have first been scraped true and the inaccuracy in the middle one has been spotted in the manner described in connection with Fig. 1.

Next, the tool post is removed from the cross slide and either a pinch bar or a crow bar obtained for the "persuading" tool. Turning to the end elevation of the set-up, the manner of using the bar may be seen; a nut or a block is placed on the cross slide to bring the bar high enough up and the slide run far enough in to obtain a powerful leverage. The crankshaft is simply pried back to shape. It will be noted that the bar is placed horizontal—this is important if the axis of the throws is vertical, for if it is not done there is danger of bending the crankshaft out of these two right angle planes and thereby greatly complicating the work.

Straightening is Done Cold

All crankshaft straightening is done cold—if the bend were so bad that heating was necessary, it is safe to say that the total cost of the work, by the time the shaft was back in the engine, would exceed the price of a new shaft. An exception to this is the cold weather job—in winter a shaft may be brought in that is ice cold—it should never be touched until its temperature has risen to that of the room, a quick way of doing this being to lay on steam pipes.

Barring extremes, a crankshaft is not weakened by taking out the bend. A careless workman, however, can do much damage in the process, chiefly by lack of protection for the journals during the work. Pieces of felt or wood or leather ought always to be placed on the finished parts.

Sometimes it is impossible to get all the bend out. This occurs where there has been a short kink in the shaft. It is then straightened to average true in the best manner and the journals are machined. Machining should not take off more than .005 of an inch in diameter. Ford crankshafts are stiff enough to turn successfully without the use of steady rests—all that is required is a slow speed of the lathe and a tool with a fine round point.

If a crankshaft is found to be not over .002 of an inch out or has been straightened to that point, it is hardly advisable for the average person to try to better this; an inaccuracy no greater than this will not cause trouble either in running or fitting—pressure of the hand will spring the shaft double this amount. The eye has to be depended upon to show the inaccuracy of the shaft on centers—it requires practice to detect spaces but a few thousandths of an inch wide—an aid to the work is a piece of light paper laid under the shaft so that the line of vision through the space falls on the paper.

After the shaft has been corrected, it is a good plan

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to test the face of the flange end. If this runs out, the flywheel will also and, in the case of cars with cone clutches, the clutch will be so much out as to cause very uneven wear. A shim cut down the flat face will put the flange in good order and will be so slight as to have no effect as regards the position of related members.

Resurrecting An Automobile

Part Seven

By James F. Hobart

WHEN Mr. Smith acquired possession of his 1914 Cadillac car, he could find no oil or grease in any of the cups or oil-holes. After lubricating everything as described in a preceding story, looseness and lost motion began to develop here and there and Simon started on a hunt one day for looseness, lost-motion, and "wobble" in the steering wheel and its connections—and he found heaps of it and cured a whole lot!

The first thing he did was to jack up the front axle so that both wheels hung clear of the floor. He blocked securely under both ends of the front axle, in addition to the jack under one end, for he had not the least idea of letting the car down when he perhaps had a wheel off, through any accidental *kicking-out* of the lifting jack. With both wheels clear of the floor Mr. Smith could swing them around with the steering wheel and also turn the whole mechanism from one wheel as fast as the lost motion in axle and steering rod connections made it possible to do so.

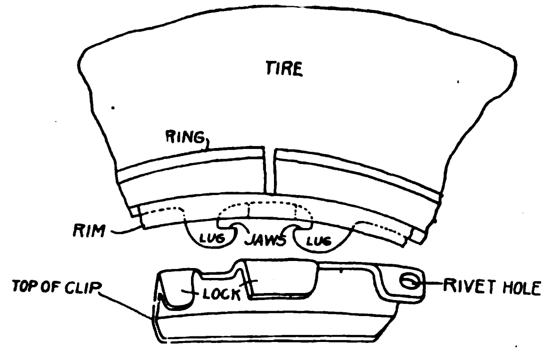
It was discovered that a good deal of the lost motion was in the rod connections between steering wheel segment and the knuckle to which the steering rod was attached. This connection was found encased in a leather "boot" or guard, which, upon removing, was found to have covered more oilless connections, with a deal of play between the parts.

A Big Screwdriver

No screwdriver could be found large enough to start the take-up screw in the front end of the rod which connected the steering wheel mechanism with the front axle. The neighboring garage had no screwdriver powerful enough for this job, whereupon Mr. Smith "reckoned he would Simondize a screwdriver" and so have one all his own!

While trying to locate a bit of steel which could be made into a wide screwdriver, Mr. Smith remembered a piece of broken spring which a few days before he had seen beside one of the streets in the village. He went after the spring and found it to be eight inches long and an inch and a half wide as shown at A in the cut called "Home-Made Wide Screwdriver." The bit of steel was heated, straightened and the ends ground as shown, one end B being merely cornered a bit while the other end C was ground to one and a quarter inches in width and to a sixteenth inch thick. The sides were ground a bit concave in regular screwdriver fashion.

Later, a notch D about five-sixteenths of an inch wide and deep was ground and filed in the end of the tool as shown by one of the sketches, and thus notched the tool proved the handiest ever for removing the *saw-handle nuts* from the bolts which held in place the door to the storage battery locker. The notch permitted the



Defective Ring and Clip

screwdriver to straddle the bolt and loosen the big round nuts in a hurry.

A handle was made for this little tool by doubling over the end a bit of old strap E which was hammered flat at the bend and made to fit tightly in the middle of the end B of the steel—just between the two ground-off corners. Then a lot of friction (electrician's) tape F was wound over the leather and steel until a sort of knob was formed as shown by one of the sketches. This formed a handle for the tool which was much appreciated as it enabled great pressure to be exerted against the end of the tool.

The adjustment in the end of the steering rod was easily taken down with this tool which was used as a screwdriver and pressed firmly into the slot with one hand while a ten-inch monkey wrench, well tightened against the tool as near the flatted point as possible, enabled Mr. Smith to back out the adjusting nut in a hurry. Behind this nut was found lost motion and bone-dry parts which apparently had never felt oil. The *screw-nut* removed as above was found to bear against a thick round piece of steel, one side of which had been cupped out to fit the ball end of the steering connecting rod. It was an awful job to coax the above mentioned half-socket out, but finally it was accomplished and then

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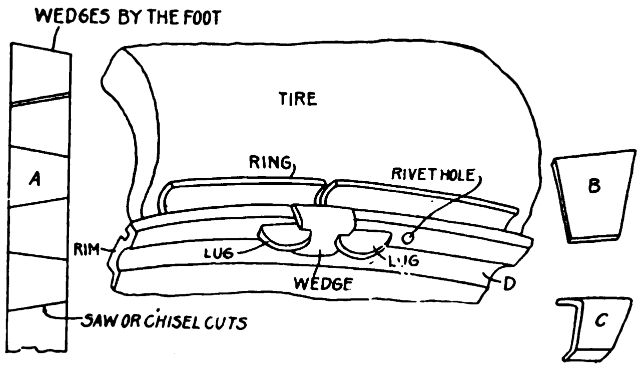
Mr. Smith was able to clean the ball and socket connection thoroughly. and to pack it well with cup grease after which the socket-washer and round nut were replaced and adjusted. The end of the nut in question carried three slots, crossing each other at 60 degrees, thus castellating the round out—after a fashion. Several holes had been drilled through the sleeve into which the round nut screwed and these holes were made at unequal angles around the sleeve circumference.

Thus Mr. Smith found it possible to make a close adjustment of the ball and socket connection above described and yet bring one or the other of the slots fair with a pair of the holes in the sleeve. When this connection was taken down, a wire nail did duty as a cotter in the slot, but a real cotter pin was used when Mr. Smith finished the job of adjusting the connection. Nearly one-half the lost motion was gone from the steering wheel after this connection had been set up.



Home-Made Wedge Which Held Fast

The leather boot had been laced partly with a leather string—which had evidently rotted, and partly with a common shoestring. Mr. Smith discarded both and replaced the boot—which was well cleaned and oiled with tallow—with some very soft No. 18 copper wire which had been heated red hot and quenched in water to make it still more soft and flexible.

Other Steering Wheel Adjustments

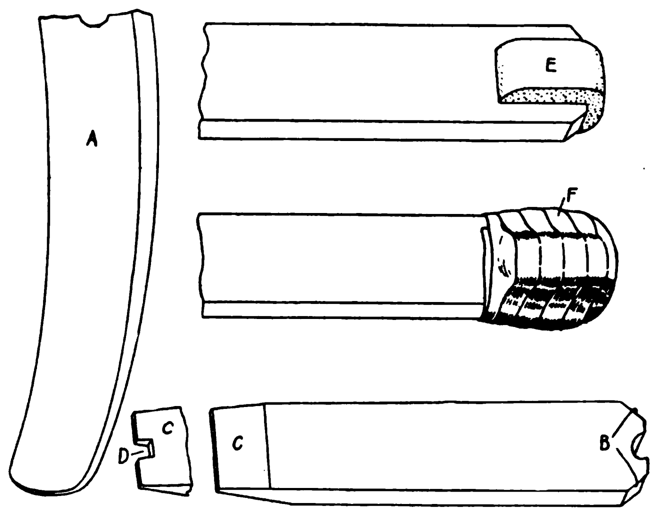
The other end of the connecting rod was treated in like manner but was not found in as bad condition as the forward end of the rod. Possibly more oil had found its way into the connection from the steering wheel shaft and housing. At any rate, when made tight, far less lost motion had been removed from that connection than from the forward one, and the steering wheel still had nearly two inches of movement before the car's forward wheels would begin to move.

There was, so the instruction book showed, a worm and segment in the steering gear housing, with some set-screws and lock-nuts thereon, by means of which the worm and gear could be brought closer into mesh whenever wear developed lost motion between them. Mr. Smith tried to loosen the check or lock-nuts but was unable to start them with any wrench which he could find or borrow.

Mr. Smith nearly gave up in despair when he happened to see a tool which he used when changing tires. It was a sort of pinch-bar, about 20 inches long, of "H" section and evidently a drop forging. The engraving A herewith shows about the appearance of the tool which had been bent at either end by hard usage. The hole B in the round end had been badly battered out of shape as shown.

The tire tool was carefully straightened, then the hole in the end was filed out "hex.' A hex nut B which was the same size as the check-nuts on the worm-adjustment set screws was hunted out as shown by a sketch and tapered a bit with a file as at C. Then the thread was filed out and the hole squared at D so the hex nut would fit the heads of the set-screws in the adjustment. The square hole nearly cut the hex nut in half, but by filing off the corners of the cap screws a trifle, enough of the nut was saved to hold it together.

Mr. Smith slipped the hex hole E in the tire tool down over the lock-nuts on the set screws, applied a monkey wrench to the tire tool and yanked the lock nuts loose in a hurry. Then the tapered hex nut was slipped into the hole in the end of the tool and placed upon the set screws, one after the other which were turned a quarter of a turn each, until the lost motion had been removed almost entirely from between worm and segment. Then, the nut was rapped out of the tire tool and lock nuts tightened upon the adjusting cap screws.



Home-Made Wide Screw Driver

That wrench proved the handiest thing ever for reaching nuts and set screws at the bottom of holes.

One morning, Mr. Smith set about overhauling the tire and rim which was being carried as a "spare." He took down the shoe, deflated the tube and pulled the tube out of the shoe and cleaned thoroughly the inside of the tire, the flap, tube and the steel rim. The latter was given a coat of graphite and water.

Some of the tires had straight sides and some were "clincher" built, the loose collars or rings which held the tires against the steel rims were made reversible and with one side fitted for straight tires while the othe side of the ring, when turned toward the tire, would fit a

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clincher. All five of the outer of split rim-rings on Mr. Smith's Cadillac car—the outside rings—were split and locked to the rim by means of hinged wedge-clips, *the* back or inside rings being solid.

Three Wedge Clips Missing

But two of the five split rings were not fastened by any wedge clips at all. The engraving shows one of these wedge-clips, together with its lock wedge and the rivet hole by means of which the clip should be fastened to the inside of the steel rim. But as stated, two of these wedge clips had been lost and the spare rim was one of them which had no locking device for the split ring. As shown in the engraving, the ring lugs, and the holes through the rim, had become so much worn that the ends of the ring no longer came together but stood apart nearly a quarter of an inch as shown.

If one cares to figure it out, this will be found to have the effect of loosening the ring on the rim, nearly a thirty-second of an inch all around—something which should never be permitted as Mr. Smith later found out—to his sorrow.

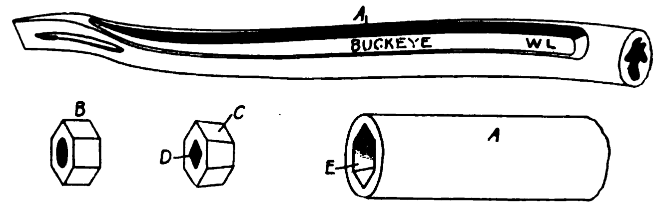
He set up the rim and tire again after cleaning it thoroughly but had trouble in making the split ring-ends come close together, also in driving the ring snugly against the rim all around its circumference. "I'll just put in a little air and then hammer around the ring as the pressure comes up" thought Mr. Smith to himself. Mr. Smith got the motor started and the air-pump running—a sliding gear is slipped into mesh to start the air pump and while the pump can be stopped while the motor is running, the pump cannot be thus started as there would be great danger of stripping the gears. Therefore, it is necessary to slip the sliding gear into mesh before starting the engine—all this had been done and the pressure had begun to show on the gage when a neighbor dropped in and watched operations.

Result of Carelessness

Mr. Smith promptly forgot all about hammering the ring into place and stood watching the pressure gage in the air-tube line and chatting with his neighbor. The rim and tire had been strapped loosely in place on the "spare" carrier and Smith and neighbor were standing on opposite sides of it when—FLAM!—The ring blew off at 55 pounds pressure in the tube, tearing a hole as big as a silver dollar. The ring tore through the straps, breaking all three of them and hurtled past Mr. Smith and his neighbor, barely missing both of them.

The tire was uninjured. Another inner tube was put inside and Mr. Smith pumped it up without trouble but he was very sure to tap the ring with a hammer all around—as soon as the air started and until the ring had seated itself closely all around against the rim. Mr. Smith attempted to replace one of the wedge-clips same as shown in the engraving, but he could not make the rivet hold very well and the clip kept getting loose, unlatching and "slapping" back and forth while the car was in motion until he finally removed the clip again in disgust.

The matter of the blow-out had been forgotten until one day, Mr. Smith was just driving away from his house when "Ker-Flam" off went that same ring again, this time going entirely clear of the car and actually striking a gate post. The tire was not injured, but the inner tube was split about 14 inches and the ring was kinked in two places. Mr. Smith took a chopping axe-



Making A Special Wrench

head to the ring with the smooth end of a chopping block for an anvil. He straightened out the kinks and set up the wheel again with a new tube inside the tire.

Locking the Ring

Mr. Smith hunted around in the garage and found a strip of galvanized steel which had been thrown away by a local tin-smith. (Two strips of the steel, about an inch wide are clamped around every bunch of galvanized sheets received by the tinner, and his men, in unloading the packages, found it easier to knock off the clips and move half the package than to lift all at once. Several of these new strips of steel were left by the railroad and Mr. Smith took them home.)

Mr. Smith cut up one of the steel strips as shown by the sketch at A in the cut—and used a chisel for cutting some of the pieces, the hacksaw for others, until the whole strip had been cut into rim wedges. One of these wedges, after it had been squared up with a file or by grinding, is shown at B—and after having been put in place, the wedge looked somewhat different. About in fact, as shown at C—with both ends bent over and hammered down.

The large sketch in engraving—Home Made Wedge Which Held Fast—shows how these wedges are to be used. One of them would be entered between the lugs, driven as far as the wedge would go easily, then the ring would be hammered and the wedge driven farther in between the lugs until it could be driven no more, when the outer end would be bent over and hammered flat against the outside of the rim as shown, perhaps even lapping down upon the split ring. The other or narrow end of the wedge would then be driven inward and bent against the groove D in the ring as shown by the engraving.

Thus locked under the rim, it was impossible for the wedge to work out and there was no more blowing out of rings with Mr. Smith's Cadillac.

Professor—"Now I put the number seven on the board, what number immediately comes into your mind?"

Class (in unison)—"Eleven." —*Lehigh Burr.*

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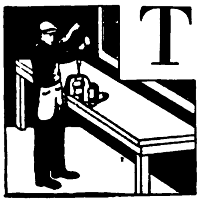
Bending Rods and Tubes

By J. F. Springer



THE bending of rods and tubes naturally divides itself into two procedures, according to whether the work is to be done cold or hot. Cold bending has some advantages and disadvantages. There is, generally, more or less danger of developing cracks or other breaks. On the other hand, cold operations are, in general, more easily brought to exact size and form; and there is, of course, no damage to the internal structure of the nature induced by enlargement of the granular structure. However, cold operations do affect internal conditions and these in turn do impair the physical qualities. The advantages of bending the work hot are rather obvious. The metal readily yields and there is but a limited danger of developing cracks. Offsetting these is, particularly in the case of low-carbon steels, the disadvantage arising out of the enlargement of the grain.

There are methods of restoring the quality of the metal damaged by hot and cold operations. I speak now, particularly, of steel. But, with low-carbon varieties of steel, the enlargement of the grain is difficult to correct with any degree of perfection by heat treatment and the alternative method dependent upon mechanical working of the hot metal is hard to make effective everywhere. The annealing of work strained and hardened by cold operations is probably much more effective than a similar treatment applied to the restoration of the grain size of low-carbon steel that has been overheated. As overheating is essential to hot bending, it would appear that, if the work can well be handled cold, that is the way to proceed.

It is marvelous the amount of metal that can be moved about under cold processes. This statement may be illustrated by calling attention to the reductions in size effected by cold wire-drawing; the cold-drawing of seamless tubes; the cold-rolling of screw threads; and other operations. The fundamental principles underlying success may be expressed about as follows:

(1) Particles of metal may be shifted relatively to each other without real damage, provided the metal is in a softened condition and the movement of each particle around another is very slight; and

(2) A succession of slight shifts, thus producing a considerable total of relative movement, may be made without real damage, provided a proper annealing treatment be given at frequent intervals. Applying these principles to the cold bending of rods and tubes, one obtains these rules:

(I) Make sure that the metal is in its best annealed condition;

(II) Bend in such way that the change of curvature at any one operation is slight;

(III) Anneal frequently.

Let us pay attention to No. II. In general, one will start with a long, straight rod or tube. There are several things to take into account. First, there is the degree of curvature finally wanted. Second, the size of the cross-section will play an important part. Other things being the same, it is more difficult to bend successfully a 1-inch round rod than a similar rod of ½-inch size. Third, the form of the cross-section affects the procedure. Now, the ultimate radius of curvature, the area of cross-section and the form of it are all fixed matters. But, one is permitted to introduce as many stages between the straight stock and the final radius of curvature. If one has to produce a ring having a radius of three inches, he may, if the character of the metal and the form and area of the cross-section require it, begin by curving to a three-foot radius or even to a longer one. The next stage will be a shorter radius. How much shorter depends upon the things just mentioned. It will be seen, then, that one may pass from straight stock to a sharp curve by introducing enough intermediate curvings to make the step from each to the next a small matter. Here is the great principle of successful cold bending, whether the work be solid or tubular, whether the section be plain or complex.

As to No. I and No. III—one has simply to attend to the annealing operations, making sure that they are adequate and sufficiently frequent. In the cold-drawing of seamless tubing, after the original billet is pierced and the cold-drawing begins, it is necessary to follow up pretty much every substantial change in wall thickness by an annealing operation.

The marvelous results obtained in this line of manufacture is due to the small reductions at a draw and the multitude of annealings. I doubt if anyone knows whether there is a limit to the process as long as these two principles are permitted to control. The metal must be good. That is, it must be good, homogeneous steel. Where the metal of the work differs in spots in respect to the amount and nature of impurities, more or less trouble is to be expected. But, with metal of good quality, everywhere the same, splendid results can be gotten in cold bending by following rules No. I, II and III.

Cold Bending

Proper bending operations require forms of some kind. Various devices have been developed to a greater or less state of perfection. Some are comparatively simple and others are somewhat complex. In general, one needs an inside form against which to bend the rod or tube. It will only sometimes be necessary that this inside form or mandrel be a full circle. But, if one is going to

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follow Rule No. II and reduce the radius of curvature by degrees, he will need a series of inside forms. It will be simple just now to consider how to provide for a single bending to a given size and then, later on, apply the results to repeated bendings to a shorter and shorter radius.

One of the most difficult things to provide is a simple means of holding one end of the rod or tube while the bending goes on. If the work is a rod and the bending is to be done on top of a horizontal slab, then removable pins may suffice. Holes are provided into which pins may be inserted. One pin on each side of the end of the work that is to remain fixed may provide all that is necessary. A number of holes may be provided, so as to take care of different thicknesses of stock.

When Rod Slips

If trouble arises because of the rod slipping, then a hole may be bored horizontally through the rod and a short piece of metal run through it, the idea being to let this piece come up against one or both of the pins. If slippage occurs in both directions, two such horizontal holes may be provided and a short rod run through each, one forward of a pin and one to the rear. A wooden wedge, of hard wood and slight taper, may be interposed between a pin and the work, either for the purpose of securing a hold on the work when the pins are too far apart or of preventing possible damage to the work from contact with the pin. Or, if the work is not especially heavy, wooden pins of substantial size may be used instead of metal ones.

Pins, whether of metal or wood, should fit tight in their holes. There should be no play. If they give trouble by coming out, they may be designed to prevent this. A projecting end on the other side, provided with a slot into which a wedge may be driven will suit some; others will perhaps prefer a threaded end and a nut. In either case, a shoulder should be provided on the pin on the working side of the slab to resist the wedge or the nut. That is, the pin will advantageously be made smaller in diameter where it passes through the slab. Where the work is tubular, pins may seem unsuitable. However, by plugging the end of the tube, say with a hard-wood plug, the work will be better fitted to resist deformation. Further, it will sometimes be the case that even with pins and an unplugged hole, the deformation may be such that it may readily be smoothed out at the finish. Wooden wedges, or soft-metal ones, may be provided with a suitable groove for contact with the tube.

Making the Mandrel Secure

The mandrel or form for shaping the inside of the bend may be secured, either permanently or removably, to the slab. Its curved edge may be left cylindrical or provided with a groove, according to the form of the work. If the work is round in section, then the groove will properly be round also. The radius of curvature of the groove section must, however, be at least as large as that of the cross-section of the work. I am speaking of a section of the groove made by a plane passing through the vertical axis of the form or mandrel. The number of degrees in this arc need not, generally, be anything like 180. Half of that will ordinarily be sufficient. If the radius of curvature of the groove section is made longer than that of the cross section of the work, it should be only a trifle longer. Otherwise, the work will not be properly supported when it is bent against the form or mandrel.

I come now to the appliance which does the active part of the bending. This may be a long lever, pivoted at the center of the inside form or mandrel, which is provided with a pin or short arm somewhere between its ends. This pin projects at right angles. The object in view is to force this pin against the outside face of the work and cause the rod or tube to bend as it is pressed against the inside form. Naturally, this projecting pin will slide against the work as the lever is swung round. This may

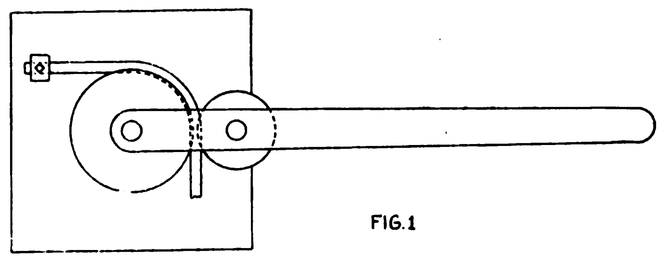

FIG. 1

A Simple Machine With a Square Table Used for Bending Tubing

or may not be objectionable. Cold bending involves overcoming of considerable resistance, precisely because the work is cold and stiff. Consequently, the slide and pressure combined may result in an objectionable abrasion. There is no slide, let it be noted, next the inner form, but there is plenty next the pin.

Or, the effect may, in the case of tubes, be a deformation of the work. Now, there are ways of providing against the deformation; so that all that we need now consider is the elimination of the slide. This may be done by putting a roller on the pin. Further, the roller may be grooved so as to fit the work more or less closely. The diameter of the roller has but little to do with the radius of curvature of the bend that is being impressed on the work.

However, if it is too small, it will naturally tend to indent the work. Whether it indents or not will depend upon other things as well. Thus, if the work is rather soft, or if it is difficult to bend, or if the lever is operated in a jerky manner, indentations become possible. Accordingly, the roller should have a generous diameter.

After that, the work may be changed, the diameter of the inside form may be altered, or the metal of the work may be varied—it will make little or no difference. The one size of roller will answer. But this does not necessarily mean that the one groove in the roller will suit all cases. The radius of curvature of the cross-section of the groove should not be less than the radius of curvature of the cross-section of the work. Like the groove on the edge of the inside form or mandrel, the number of degrees in the arc of the cross-section of the roller groove need not exceed, say, 90.

In general, it will be necessary to change the inside

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mandrel every time the curvature of the bend is sharpened; but this does not apply to the roller. Consequently, in order to effect the gradual reduction of the radius of curvaure of the bend, one may provide a series of mandrels. One slab, one lever and one roller will suffice for quite a number of changes. Illustrations of two devices which have been developed along the lines set forth in the foregoing, are shown herewith.

In the first place, as shown in the diagrams, there is provided a flat surface in the form, say of a casting. The top should be surfaced by the planer or else a special surface secured in place. If the machine is to be used only and solely for cold work, then a hard-wood top will answer very well. A vertical, removable pin is provided for the center of the table and a proper hole prepared for it. An underneath boss on the casting supplies metal for a good depth of hole. The pin is to furnish a journal bearing for the mandrel and for the lever. As the mandrel does not rotate, the fit may be made quite snug.

The lever is rather broad, so as to be wide enough, when provided with a short slot, to straddle the top of the pin. This lever may be made of hard wood, especially if the work is to be bent when cold. By providing a horizontal circular groove at the top of the pin, it will be easy to secure the lever rotatably in place by the use of a bolt and nut. This arrangement is shown sufficiently in the drawings. It will be noted that, when the mandrel has been set in place and the lever is secured by the bolt, the mandrel is then held fairly well to its proper position.

If preferred, the pin may be lengthened and the hole in the work table continued all the way through and the pin then properly secured in such way as to prevent the success of any tendency to "ride up." The lever is provided with a series of holes along its length. The roller may be set, now at one of these, now at another, and thus provide for various sizes of mandrels.

Another variety of bending machine is shown in the accompanying drawings. A multitude of holes pierce the working table. These are placed so as to form a

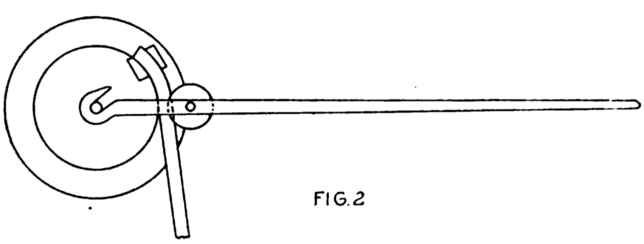

FIG. 2

A Rod and Tube Bending Machine With a Circular Table

series of radial rows and also a series of circumferential rows. By using any one of the circumferential rows, one may bolt onto the table a series of segments of an annular ring and thus provide the interior mandrel. Or, the annular ring may be in a single piece. By using all the circumferential rows, one may provide for a series of stages of bending.

It is not necessary that the holes in each radial row shall be in a straight line. They may be staggered. Staggering the holes in these rows permits an increased number of circumferential rows. It will be noted that, except for the outside circle, the holes are already provided for the devices to hold the one end of the rod or tube. The remainder of the device is much like the preceding one. The lever will naturally be made of metal. The hook-form of the fulcrum end permits ease in putting it into position.

It has already been pointed out that it will not always be necessary to provide a complete circle for the inner form. When only an arc is used, it will accordingly be necessary, in making a bend longer than that arc, to slip the work along from time to time and make a new start. Thus, if one is bending a rod or tube on a 60-degree arc on a radius of 14 inches, only about 16 inches of work may be bent at one setting. To go on, one pushes the work back past or through the holder and starts again.

Rigging for the Work

If the bending required need not be especially accurate, one may rig rather simply for the work. A suitable space on a vertical wall, preferably on the outside near a corner, is selected. A number of arcs of angle-iron are prepared, corresponding to a series of radii of curvature. These are bent so as to have one flange form a cylindrical surface and the other to form an inwardly-projecting flange. Suitable bolt holes are bored in this flange and the arc thereby secured to the vertical wall.

One end may be arranged near the corner and so that the cylindrical surface at this end shall be approximately horizontal. At the other end, at a suitable point, a pin or other holding device is secured in or to the wall so as to provide for holding the work against the angle-iron. To use these arrangements, one puts one end of the work between the arc and the keeper, using the rod or tube itself as a lever, and bends it against the curved surface. By arranging a series of such arcs and keepers, one provides for changes of sharpness of curvature. The advantage of a location at a corner consists mainly in the working space thus provided. This rather simple rig may answer many purposes, as, after all, it is only the last bend that needs to be made with exactness. This being so, the foregoing general scheme will suit the necessary conditions for the preliminary work in very many cases. A bending machine with the roller device may be provided for the purpose of using it only on the last one or the last one or two of the necessary bends.

Where the mandrel consists of a solid wheel and not a rim, a series of sizes may often be rather conveniently made of wood and then bound with a metal tire. Or, a wooden rim may be made and then bound with metal. It may not be convenient to attempt making the inner outline of the rim circular. If it is made in segments, the inner boundary of each may very well be straight. These wooden mandrels bound with metal may also be used in hot work.

Hot Bending

Hot bending may be performed in ways and by means very similar to those employed in connection with cold

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bending. It may be necessary to eliminate the use of wood at some points in a machine. The bending itself is an easier proposition because of the softer condition of the metal. It should be noted that one may effect a kind of compromise between cold and hot bending. Instead of using high heats, such as those corresponding to a white or a yellow, one may use heats corresponding to an orange or even a red. In the last case, the effect on steel would be little or nothing, in so far as the heat is concerned. Easier bending and elimination of a good deal of the trouble from cracks and breaks are brought about. As to final accuracy, one may bend almost to the final curvature by the moderately hot procedure and *finish with a cold bend*.

Angle Bars

Where angle-bars are to be bent, especially where the flange which is to remain in a horizontal plane is to project on the inside of the bend, some difficulty may be expected. If the curvature is sharp for the cross-section of the bar, then it may be absolutely necessary to heat the work—perhaps, even to a high heat. However, one is to remember that with a high quality of metal (in respect to purity and homogeneousness), considerable changes may be made cold or moderately hot, provided the total change is divided up into very small changes.

Other Difficult Shapes

Other difficult shapes, as where an I-beam or a channel-bar is laid on its face preparatory to bending in a horizontal plane, are to be handled after the manner of angle-bars. Perhaps there are cross-sections of such size and shape that they cannot be satisfactorily bent on relatively short radii of curvature, whether the work be heated or not and whether it be done a little at a time or not. But so much can certainly be done that at first sight seems practically impossible that one must not be rash in deciding that a given job cannot be done.

A Suggestion

Sometimes, one may find it advantageous to use the hammer to facilitate bending. The outside circumference being always longer than the inside one, the material of the work is forced together along the latter and spread apart along the former in any attempt at bending. Now hammer taps may perhaps facilitate the spread on the exterior circumference. This is a suggestion and is not put forth as the result of any one's actual experience. Nevertheless, it seems reasonable and is given for whatever it may be worth.

Prevention of Collapse in the Case of Tubes

Tubes will often, not to say generally, need support on the inside to prevent collapse. Whatever is used has to satisfy several requirements:

(1) It must bend;

(2) It must continually provide support; and,

(3) In the case of hot bending, it must behave satisfactorily under the influence of the heat. Clean sand satisfies these requirements perhaps as well as any one thing. It is necessary, however, to confine it in the tube. This may be done in various ways. Thus, metal caps screwed on to threaded ends of tube provide one means.

Plugs of hard wood may be secured in the ends by pins driven in through the wall of the tube. Lead is a suitable material, insofar as support of the tube and responsiveness to the bending movement are concerned; but it has too low a melting point to be generally useful in hot bending, unless perhaps it may be confined. For cold bending it is excellent.

The tube is first filled with molten lead, or at least the region to be bent is thus filled. When the bending is over with, the lead is gotten out by heating the tube on the outside. Sometimes a brass or steel rod, fitting the interior of the tube rather closely, may be used to advantage. The thing to consider beforehand, however, is whether the rod can be gotten out again. The whole of the rod in the tube must be curved, and curved to precisely the same curvature; otherwise, the rod will refuse to come out. This is the general rule, and there are few or no exceptions. The tube may be bent to a helical form with the rod inside without making it impossible to get the rod out.

GRAND CENTRAL PALACE TO HOUSE NEW YORK AUTO SHOW

GRAND CENTRAL PALACE will again be the scene of the annual national automobile show in New York City, January 7-14, 1922.

Decision was made earlier in the year to exhibit at Madison Square Garden if the Palace could not be secured. It was believed that the exhibition hall which has housed the New York automobile shows in recent years would be converted into office suites; and an option was accordingly taken on the Garden with the understanding that the larger quarters of the Palace would be utilized if available.

The national automobile show at Chicago will be held in the Coliseum and the 1st Regiment Armory, January 28th-February 4th, 1922.

Both national shows are under the auspices of the National Automobile Chamber of Commerce.

TO REMOVE WATER FROM GASOLINE

By N. G. Near

AN EXCELLENT way in which to remove water from gasoline that is not very well known is this: Simply wet some waste or a cloth in some water and wring the water out with the hands. The waste will still be moist. Then dip the moist waste in the gasoline. The waste will not take up any gasoline but it *will* take up water. If the gasoline contains considerable water repeat the operation until all the water is removed.

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

What About Taxes?

TO SOME of our readers it may not seem fitting that a matter of politics should find a place in an automobile magazine, but we would not feel that we were doing our duty if we did not make some comment upon a subject which directly affects every automobile owner; we speak of the proposed, direct tax upon automobiles. Since this particular tax is but one suggestion of many it is proper that we mention and discuss, to a limited extent, the main propositions.

Money to support our Government is obviously necessary and there is but one way that this money can be raised,—by taxation of the people. We deplore the necessity of taxes, but we know that they cannot be eliminated. We can only hope that an effort be made to reduce the unnecessary expenses and finally, when it comes time for us to pay the bill that the taxes be assessed in an equable basis. Admitting as we do, that money must be raised through taxation, the question is, "how should the taxes be assessed"? For the past few years taxes have been assessed upon net incomes. Where the net income exceeded a certain figure the tax rate was increased. In the case of corporations the net earnings were taxed with due regard to the amount of money invested. If a corporation earned an excessive amount, in relation to the money invested, then an excess profits tax was levied. Theoretically the idea seems sound, practically it is unjust. No differentiation was made between the risks involved as compared with profits. Thus it might happen that the large profits of a powder mill, for instance would be assessed the same tax as would similar profits from the equal investment in a railroad. Money in a powder mill investment should earn more, proportionately to that put into a railroad because the investor stands a good chance of losing his entire investment at any moment.

Under this system of taxation it was an easy matter to spend money under the head of "expenses" and so cut down the profits, yet so spend that money that it really added to the total capital.

The Federal Government recognizes the unsoundness of such a method of taxation and is now looking for another method. It is considering, or at least a number of methods have been suggested. The sales tax is perhaps the one most favorably considered. By this method it is proposed either; (a) to levy a tax upon every turnover of goods; or; (b) upon every retail sale made. Secretary Mellon has suggested that a tax of ten dollars be levied upon every automobile in the country.

Now it really does not matter *how* the tax is made so long as every person pays his share. A certain amount must be collected. But why should any particular industry or any particular class be obliged to pay a larger proportion than any other? Just because a man owns an automobile should he be chosen to carry a heavier load? Why not tax wagons, carriages, bicycles, hats or even do as they do in Asia, levy a tax upon windows?

Our President, in his first message to Congress stated that the automobile has become an indispensable instrument. We might claim the same thing of bath-tubs and not be ridiculous. No form of taxation upon a certain class, as a class, will ever be a success.

We contend that a tax upon automobiles is grossly unfair and discriminatory. It is far more unfair that would be a tax upon the air which we breathe because it would result in a few people carrying a heavier weight than others. The American people would chafe under such a tax far more than under any form of sales tax which could be levied.

We hereby publicly protest against the levying of any tax upon any particular product as discriminated from any other product. If our Government wishes to tax automobiles, then it should levy a proportionate tax upon every product from shoe-laces to battle-ships. And in voicing this protest we are sure that we speak for every one of our readers; yes, more, we feel that we speak for the public at large whether they own automobiles or not, for nothing can be "American" which tends to discriminate against a group.

WAR DEPARTMENT AWARDS CERTIFICATE OF MERIT TO N. A. C. C.

TO THE National Automobile Chamber of Commerce has been awarded a Certificate of Merit by the War Department of the U. S. in recognition of loyalty, energy and efficiency in the performance of its war work, which materially advanced the war program.

The citation by the Director of Purchase, Storage and Traffic at Washington, says that the certificate is awarded

"For the hearty and efficient co-operation in response to the need of the Government for Motor Vehicles in

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the War with Germany. They immediately placed all their resources at the disposition of the Army, waived individual commercial advantages, extended their facilities and organization, and finally accepted cancellation of their orders cheerfully and at bare cost on the suspension of hostilities."

This visible recognition of patriotic war service will be highly appreciated by the automobile industry which contributed all it had to the war program. It established headquarters at Washington, with representatives in charge who knew production, engineering and transportation that were helpful to the governmental program. The industry made trucks, tractors, airplanes, engines, motor cars, field kitchens, shells, guns and many other articles for which it was well equipped.

Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered By an Expert for Your Aid

By Joe Bell

Building Up Worn Sections

THE "putting-on machine" has been talked of for years but the nearest to it that has yet been developed is the welding torch. This method of building up worn sections has saved thousands of parts from the scrap heap. Thousands more could be saved by some other method if a method were developed that was applicable. The journals of a shaft wear small—sometimes the shaft may be welded up, sometimes it can be turned and a sleeve put over it, sometimes the shaft may be trued up and a new bushing made whose inside diameter fits the undersize shaft.

An entirely different method will be disclosed. Like the methods named above, this one is good under the usual circumstances of repair work. (New parts are better in most cases but they cannot always be obtained.) By dipping the worn end of the shaft in a pot of melted brass or bronze, a thickness of metal will be added that may be filed or turned to the desired original size. If the shaft is a driving fit in the mating piece, this simple process will do the trick. If it turns in the mating piece, it may be necessary to reduce the shaft or to bore out the surrounding part so that a substantial thickness of yellow metal is obtained; when this kind of a fit is to be made, it is better to tin the journal over with a soldering iron before dipping in the bronze, as this makes the latter adhere tighter. When quite a thickness is desired, several dips must be made. This process is a first class repair job.

The question naturally arises as to how many pots of molten brass there are around the average shop. None, though it is not hard to create the same if there is much scrap about the place, but there are foundaries in every community which are melting brass and bronze every day and which will permit the dipping at a per pound rate. Where it is only required to fill a hole (as for a driving fit), a single dip with its relatively thin wall is practically where the shaft turns in a bearing, at least a sixteenth of metal should be added (for strength, for the new metal is really a bushing shrunk on) and the tinning done to make a more perfect adhesion between the two.

The Outside Work Bench

THERE is a man in our vicinity who owns three garages, a monument to perseverance and thrift for be once worked in over-alls for 12 dollars per. His practical experience was conspicuous for the amount of running back and forth that he had to do. He noticed that a goodly share of the repairs consisted of light jobs and adjustments done to cars drawn up to the curb—jobs that would take from ten to thirty minutes, but invariably the work necessitated the use of a vise and a work bench and to get this, he had to travel a hundred feet each way to the shop in the rear.

This Outside Work Bench Saved Many Steps and Proved of Great Help

The idea of putting a bench out in front grew from these wasted steps. A glance at the photo shows a substantial bench and a good vise on it. The scheme saves the time of good mechanics and it pleases the customers immensely. Any garage could copy this to advantage and where there was no room outside a bench could be located just inside the door.

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Why Does a Car Turn Around?

HUNDREDS of scared owners have asked themselves that question. They have been upon a slippery road and some circumstances has necessitated a quick application of the brakes. A second later they found themselves and the car turned around and facing the other way, or at least the car has made a portion of a revolution.

Why did it rotate instead of going straight ahead to a stop? Aside from some peculiar road condition, the answer is "unevenly adjusted brakes." If the rear axle were a continuous piece of steel like the axle of a railroad car, the turning around could not occur with the unevenly adjusted brakes but the automobile has a divided axle with a differential, or compensating gear, in the middle.

Assume for an extreme that the brakes are so set that the left rear wheel can be locked before the right wheel brake takes hold at all. Then when the driver slaps on the brake, that left wheel ceases to revolve—it drags so hard that it slows up the car before the driver realizes what to do next. That dragging wheel then becomes a pivot about which the car may turn and the engine still running at a good speed revolves the right wheel (through the differential) and it pushes the car around in what engineers call "counter-clockwise" direction. If any car owner doubts this, let him stick a "two by four" through the spokes of one wheel so it will contact with a spring, holding the wheel from turning, and carefully let in the clutch while the car is in low; to his surprise, he will find himself traveling in the direction of his neighbor's yard.

Getting Rid of the Rattle

THE LOOSENESS around spring and spring shackle bolts is responsible for much of the rattle on cars of a year or two's running. We can always get new spring bolts and new shackles and spring eye bushings, but up under the fender is a hole that, on most cars, requires a shop session to put in shape. The shackle at the back end of the front spring straddles, at its upper end, the frame, and a bolt passes through the frame and the forging riveted to the frame at this point to give the requisite width. This hole is not usually bushed and, being up where it is hard to get at the means of lubrication, the bolt generally is dry. This means that it wears the hole badly, aided by the pounding that the front wheels get and transmit.

When the car is put in the garage, it will save time to take off the front wheel—it is awkward enough at best to work in cramped quarters close to a muddy fender. Cars in the price class which do not have bushed holes will have 7/16 inch or 1/2 inch bolts. This means that a bushing should be at least 5/8 inch in diameter. If there is an electric drill in the garage, enlarge the worn hole to 5/8 inch, or over if within the capacity of the drill. Then make a steel bushing to fit and make it as tight as can be forced home; if it squeezes the hole too tight for the bolt, pass a reamer through. If there is no drill available, get a taper reamer and ream until the hole is round—then turn the bushing on the outside to fit. It should not cost over five dollars to thus fix any car and it is worth double that amount to be rid of that thump, thump, thump right in front of you all the time.

A Fallacy Regarding Brakes

"JUST look at the width of those brake drums! That car has got powerful brakes, I'll say." So spoke a man to his companion as they were inspecting a new car outside one of the palaces that line Automobile Row. And in speaking he voiced what is a very generally accepted theory regarding brakes, though an erroneous one. Brakes, as we know them on automobiles and railroad cars, are of the friction type.

Now, one of the first laws of friction is that it is independent of the area of the surfaces concerned. And this applies with full force to automobile band brakes; the width and the diameter of the drums do *not* make the brakes more powerful—extra size in these parts distributes the friction over a greater area and thus *lengthens the life of the members*—it is the amount, or intensity, of pressure that may be applied that governs the brakes' ability to stop a car.

A UNIQUE ADVERTISING STUNT

AS ONE learns of each new use to which the flivver has been put, one breathlessly asks, "What next?" Well, here's what.

An enterprising window cleaning concern of San Francisco has had built on a Ford truck a structure that is a miniature office building. Each window has its shade pulled down half way and lettered on the shades are the names of the largest buildings in San Francisco.

It is evident that all these buildings, both hotels and offices, are the customers of the window cleaning concern, and it is this concern's method of advertising the prominence of their clients.

What next?

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A Clever Advertising Stunt

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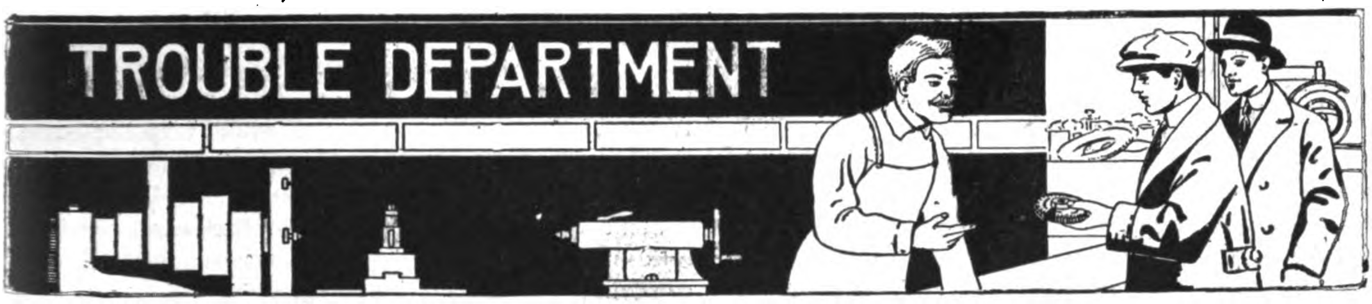

Clutch Trouble

3007

From Erman Chambers, Maryland: I have a Baby Grand Chevrolet, Model F 5, 1916. I am having trouble with the clutch because it will not hold in high gear and when left in neutral it holds so that you cannot get it in gear. There does not seem to be any one here who can fix it. Can you help me.

The clutch cone appears to be too small for the fly wheel. Do you think it possible that the fly wheel is worn?

Reply: We doubt very much that the clutch drum on your car is too small. The clutches and flywheels are all cast from one set of patterns and the shrinkage is so nearly uniform that there is not one chance in a million that there is a fault in your particular car. Our idea is that the clutch facing either does not fit properly or is so badly worn and frayed that it does not hold when the engine is running.

The chance that the flywheel is worn is also very remote. Even under extreme wearing conditions where metal runs against metal without lubrication the amount of wear in the course of a season is comparatively small. It would be an easy matter to install a clutch facing of thicker leather than ordinary, if the flywheel were worn.

As a repair to your machine we would suggest a new clutch facing. A new clutch facing, properly shaped, can be obtained direct from the Chevrolet manufacturers or one of their service stations. Directions for installing can be obtained from the same source.

Trouble with Differential

3008

From W. C. Baker, District of Colombia: I have an Oldsmobile, Model 43 on which the following trouble recently developed:

When I made a turn to the right the body of the machine, of course, tended to move in the original direction as the wheels turned. This threw a lug which is on the inside of the brake disc on the left end of the rear axle housing, and which supports the ends of the internal brake, against the inside of the brake drum on the left wheel.

This condition resulted, of course, in a loud squeaking noise each time I made a turn. Subsequent to this trouble I had a mechanic from the local Oldsmobile Service Station make an adjustment of the differential, and his suggestion (in order to remedy the difficulty noted above) was that a solid washer be placed in the center of the differential between the ends of the shafts which go through to the wheels—this in order to keep the wheel at a proper distance from the center of the frame, but as an alternative to place a washer around the outer end of the left half of the shaft so that it would be between the inside of the wheel hub and the outer end of the rear axle housing around which the left rear wheel roller bearing revolves.

As I was not sure of the suggested remedy of placing a solid washer inside the differential, I followed the latter method and placed fiber washers in the wheel hub. This has remedied the difficulty, but as there is a considerable thrust against the wheel hub in making a right turn and I feel that it is only a question of a short time before the fiber washers which I placed there will become worn to such an extent that the trouble will reappear. So far as I can determine, when the differential was opened for adjustment, its gears were in a satisfactory condition, and there is no indication of any trouble with the thrust bearing or roller bearings pertaining to the left half of the axle although the thrust bearing was not taken out.

I would appreciate very much your opinion as to what has caused this rear end trouble, which has developed after the machine has been operated about 40,000 miles.

Yesterday, in cleaning out the transmission of my car, I jacked up both rear wheels in order to operate all the transmisson gears. I understand, of course, that it is only necessary to jack up one wheel in this case but had both up off the ground and I noticed that when the gearset was engaged the left wheel did not work as freely as did the right; ran only for a few revolutions and then stopped, staying in place with a jerking motion; the right wheel ran freely. Thinking that the action of the left wheel might be due to a binding brake band, I disconnected both the internal and the external brake rods and this failed to make any difference in the condition. Is it probable that the action of the left rear wheel has any bearing on the trouble first noted above? If not, is the action of the wheel when off the ground due to the incorrect differential adjustment, and what is the effect of this condition?

Reply: The best cure for the axle and differential trouble in your Oldsmobile, Model 43, is through the installation of a bronze thrust washer on the end of one of the axles. Since the axle is of the "full floating" type, the axle may be removed without dismanteling the whole of the unit. Remove the left axle after measuring to see how thick the washer should be made. Drill into the end of the axle and attach the thrust washer to the end by means of a small machine screw. Be-

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sure to countersink the head of the screw and to pin it so that it will not come out.

The alternative, which you have adopted is a good one and we have but one criticism to make. You should have installed bronze or steel in place of fibre. There is no reason why a hard, bronze washer should not last for a period of years. Fibre, if well greased will last for considerable time provided the contacting surfaces are perfectly smooth. For heavy thrust work, and between hard steel discs, fibre is an excellent bearing material.

From the last part of your letter we would assume that there is trouble with the thrust bearing or the radial bearing. Our diagram shows only a single bearing in this car but you mention a thrust bearing. Possibly a ball is broken or the surface of the races is worn. The jerky action would not be caused by faulty differential adjustment. The jerky action, in itself, is no cause for worry because few cars operate equally on both wheels. There is sure to be more friction in one wheel than the other and the differential will always drive the wheel with the least resistance.

Wiring of Jeffery, 1916

3009

From Fred Whitaker, Massachusetts: I have a Jeffery 1916 car, model 4-462, equipped with the Bijur system, and I should appreciate it if you could kindly publish a wiring diagram of this machine.

Reply: We print below diagram of the wiring used on the Jeffery 1916 car.

Differential Trouble

3010

From A. J. Christopher, New York—I own a 1915 Courier roadster which operates satisfactorily but there is one problem which I wish you would help me solve. The left wheel seems to be the only one which drives the car, the right one seems to run free.

Some time ago I drove the car backwards without releasing the emergency brake, do you suppose that this could have damaged the differential?

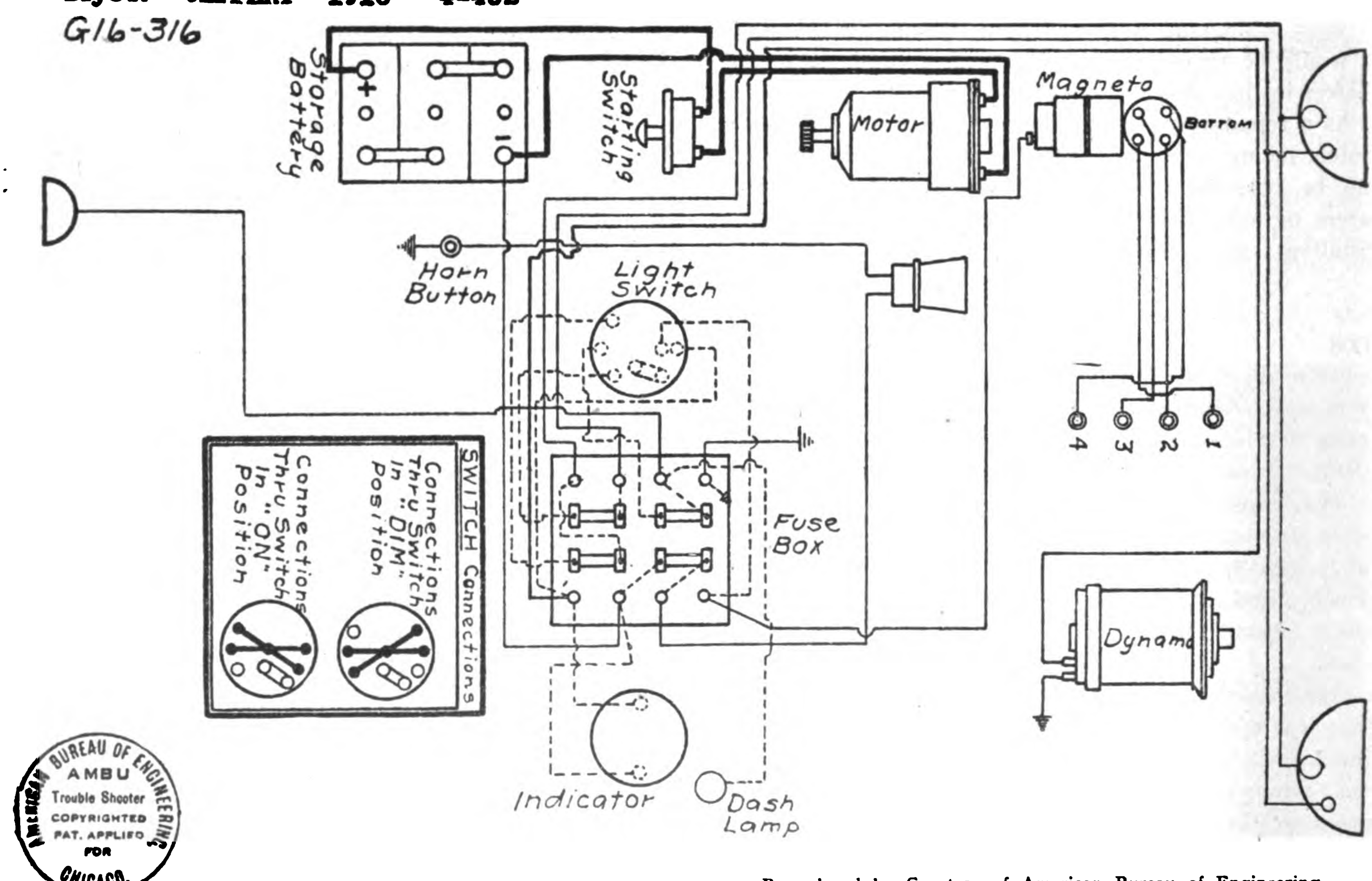
Of late I have noticed an excess amount of smoke from the exhaust. The plugs tend to foul rather rapidly and the engine heats a bit. Do you think that the oil level in the crank-case is too high?

Reply—We have no records which show us the construction of the Courier car, so that we cannot give any accurate opinion as to the cause of your trouble. Early in the automobile game there were a few cars made with but one driving wheel but we doubt that the Courier was one of this kind. In 1915 the manufacturers all realized the value of the two wheel drive and the use of the differential.

In our opinion the left wheel axle is "frozen" in the differential while the right axle gear has sheared off or broken. Such is the construction of the differential that should any of the gears be broken, or the teeth sheared off, the whole axle becomes inoperative unless the other gear or axle becomes fixed in the differential housing.

In your case the single driving wheel will tend to distort the whole frame, driving from one corner as it does.

BIJUR JEFFERY 1916 "4-462"



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This action will throw a strain upon the steering gear also and tend to cause wear on the front tires. We would advise you to take down the axle and repair it. If, however, it is one of the single-wheel-drive machines, then there is nothing you can do about it. If the differential is broken, doubtless it was damaged when the car was driven with the brakes applied.

Too high an oil level will cause excess carbonization. This trouble, which also causes the overheating, may be caused also by worn rings. If the trouble is not obviated by lowering the oil level, we would advise you to fit a new set of piston rings.

Equipping Saxon With Low Tension Magneto

3011

From E. F. Comstock, New York: I have a small Saxon Roadster and there is one thing I should like to ask you about. This motor runs on dry batteries only, and I had thought of putting on a low tension magneto. Can you tell me how this should be wired—if it can be?

Could a low tension magneto such as is used on a stationary engine with make and break spark be used to furnish the current instead of the batteries after the engine had been started? If so, how would you wire this to a car of this type?

How fast should a magneto run as compared with an engine?

Reply: A low tension magneto may be installed on any car for ignition purposes, provided it is of the right kind. You mention the type used on a stationary engine for "make-and-break" work. We doubt if this machine will work satisfactorily because it is a combination coil and generator. It probably furnishes a rather high voltage and relatively low amperage. A few tests will show whether or not it will work on the car. The machine should generate from six to eight volts at 500 revolutions per minute and at this speed it should give from 6 to 8 amperes.

As the revolutions increase the voltage should jump slightly until it reaches about nine volts. The amperage should not jump over 15. This should hold true at 1800 revolutions per minute. The machine such as you mention will probably generate an extremely high (comparatively) voltage at 1800 R. P. M. and enough amperage to burn out an average coil.

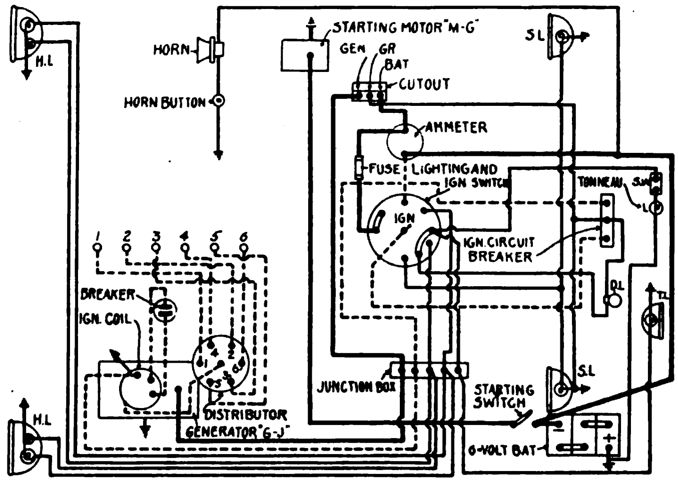
For automobile work the output should be fairly constant regardless of speed. It should be nearly maximum at 500 R. P. M. and increase very little to the 1800 R. P. M. speed. This requirement is entirely different from the stationary engine work where the speed is nearly constant.

We should advise you to install a high-tension magneto rather than the low. If, however you find, by experiment, that your low tension magneto will work with the coil within the limits given you may drive it at crankshaft, or slightly faster, speed. The convenient way to do this is to mount it on the front of the engine and drive it from the fan belt.

Stephens 1920 Wiring

3012

From C. Leman, Connecticut: Will you kindly print a wiring diagram of the Stephens Salient Six, Series 80, 1920, equipped with the Autolite system?



Stephens Salient Six, Series 80, 1920

Reply: We print above the wiring diagram which you request.

Oiling Trouble

3013

From A. E. Rosa, Delaware: I have an 8 cylinder 1917, Regal Touring Car that has been run 8,000 miles and the eight block has a very smoky exhaust and oils the plugs.

I have the head off and am grinding in the valves. I found a heavy deposit of oily soft carbon, also about a spoonful of oil on the piston in each cylinder and more than that on the piston of No. 1 cylinder.

What would you suggest I do so that I can operate this machine satisfactorily? The compression is good on all four cylinders. The cylinders are smooth as glass and not a sign of a scratch on any one. Can you help me correct these excess oiling troubles?

Reply: We assume that when you refer to the right side of the engine you mean the right side, as you face the front of the car from the seat. Excess splash resulting in over-lubrication of the right-hand block is present in nearly every eight cylinder car. We average from 25 to 50 complaints per year from subscribers with this same trouble.

Even after cylinders are re-ground and new rings properly fitted, in some cases, the lubricant works into the combustion chambers in the right block. There is but one safe remedy for the trouble. Install a set of baffle plates between the cylinder blocks and the crank case on the right side of the engine.

The lower edge of the plates should be bored so as to drain off the surplus oil. It is better to leave a fairly large opening around the connecting rod at first so as to be sure that the cylinders receive sufficient lubrication. If you find that they are being over-lubricated, put in a new set with less clearance for the connecting rods.

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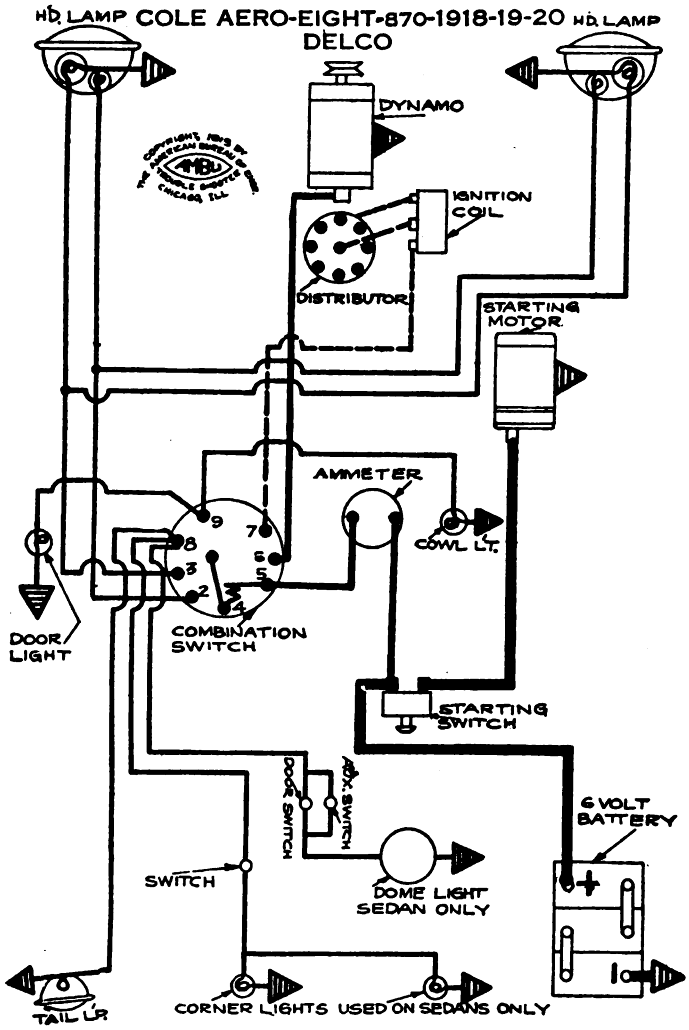
Cole 1920 Wiring

3014

From Walter Pawloski, Ohio: Will you kindly publish diagram of the wiring used on the Cole Aero-eight 1920 car equipped with the Delco system?

Reply: The diagram you request is printed below.



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Spark Intensifiers

3015

From F. B. Ladd, New York: Will you please advise me if the use of spark intensifiers on the Ford engine is liable to damage the coils or the magneto?

I ask this question because I know of several cases where coils have broken down when intensifiers have been used. In these cases, however, I believe they were old cars.

Before I install such a device I would like your opinion. I have one, made of three washers with two 1/16 inch jumps to each plug. Do you think that this is too great a gap? Should I eliminate one of the insulating washers and have but one gap?

The gaps, at present, are located at the terminals on the dash. Do you advise me to put the gaps on the plugs instead?

Reply: In the earlier coils, particularly those made before 1916, the insulation was hardly heavy enough to carry much of an over-load and frequently would break down under the excess current called for when auxiliary gaps were used. With the advance of science, manufacturers have been able to make coils which will withstand heavier loads and few present-day coils will break down. Most present-day coils are designed to carry only a limited amount of primary current. This means that the secondary current is limited, also, and so even if the secondary current finds no outlet at all, it will seldom puncture the windings.

There is little chance that intensifiers will overload the magneto of the Ford car. The magneto will furnish current to its full capacity, for a period of years, without suffering any great amount of deterioration.

We would advise you to eliminate one of the gaps and have just a single, 1/16 inch gap. The gap should be at the plug, not at the coil. There is a certain amount of "lag" which occurs in any electrical circuit and for this reason the effect of the intensifier will be lost if it is not placed at the plug.

There is one peculiar fact about high tension current which plays an important part in the construction of the intensifier, particularly when metal washers are used, separated by insulating material; there is a condenser effect.

Secondary current is very peculiar in that it can be "stored." By the process of storing the current is changed. Since many of our readers may be interested in this phase of electricity we will explain more fully.

Two conducting surfaces, separated by an insulator form a condenser. If one of the surfaces is connected with one terminal of the coil and the other with the second terminal, the coil will discharge into the condenser. The current, in the condenser, will gradually increase both in voltage and amperage until it is sufficient to overcome the resistance of the air gap between the two surfaces, then it will jump from one surface to the other.

You can see that if the conducting surfaces are very large, a longer time will elapse between each spark, than if the surfaces are small. Another thing which hastens the discharge is the shape of the discharge points. If, for instance, you use two smooth washers for the surface, the spark will not pass so easily as if you used two sharp pins.

If you make the condenser surfaces very small, then, naturally you do not get the effect of the intensifier with its increase of current. If, on the other hand, you make the surfaces too large, it will require a long time to charge the surfaces and the engine will miss explosions. Only by trying various sized washers can you get the best results.

HOPE VS. EVIDENCE

At the grave of the departed the old darky pastor stood, hat in hand. Looking into the abyss he delivered himself of the funeral oration.

"Samuel Johnson," he said sorrowfully, "you is gone. An' we hopes you is gone where we 'specks you ain't."

—*American Legion Weekly.*

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A B C of the Automobile

Description of the Various Types of Multiple Disc Clutches and Their Action

By Robert A. Chandler, S.A.E.

ALTHOUGH the cone clutch was found to work satisfactorily when kept in good condition, designers were constantly seeking something better—some type which would require less attention and, if possible, also take hold more smoothly. The ideal design was found to be one in which a film of oil was placed between two surfaces—one attached to the fly-wheel and the other to the transmission. As the plates were allowed to come together, under the action of a powerful spring, the oil would allow the driven member to slip at first.

As the oil squeezed out the driven plate would gradually increase its speed until the two seized, after which the clutch would drive without slipping. A light oil had to be used as a heavy one would not squeeze out sufficiently and the clutch would continue to slip.

This gave an ideal engagement in starting but it was found that, although the clutch took hold gently enough, it would not release. This was because the plates were too large and it was difficult for the oil to work its way back in between the plates so that they could separate.

One way of overcoming this difficulty was by cutting three or more tongues from the edges of certain plates and bending them out to act as springs. These helped to push the plates apart.

Such clutches were composed of two different metals, usually steel and bronze, because any metal has a tendency to weld to its own kind. The set of plates fastened to the inner member (and to the transmission) were smaller than the ones fastened to the fly-wheel. The springs just mentioned were cut from the larger plates and were bent in such a way that each one reached across and pressed against the spring of the large plate next to it. When the foot pushed the clutch pedal forward these springs served to separate the plates, allowing the oil to enter and free the clutch.

The Multiple-Disc Clutch Running in Oil

Another way of overcoming the difficulty was to make the plates mere washers only an inch or two wide. This was found to work satisfactorily without the use of the springs previously mentioned and this is the type used today. The old name has been retained although they are really ring clutches and not discs at all.

This is the type last described. The larger set of plates is enclosed in a housing attached to the fly-wheel and which turns with the engine. It has a series of projections which slide in grooves or along keys in the housing, allowing the plates to move forward and backward but not to rotate independently; they must turn with the fly-wheel. The other set of plates is fastened in a similar manner to the inner member (a sort of core) and is free to move like the first set. They serve to drive the inside member which is fastened to the transmission.

The plates are assembled alternately, first a larger then a smaller one, and so on. When the clutch is engaged the plates are all forced together by a heavy spring. The fly-wheel drives the housing; this drives the larger set of plates; these the smaller plates, which drive the inner member; and these deliver the power to the transmission.

Action of the Clutch

When the clutch pedal is pressed forward the plates separate because the pressure of the spring which holds them together is released. The larger set continues to revolve with the fly-wheel but the inside set slows down or stops, depending on the movement of the transmission. If the car is at rest or the gears are in neutral the smaller set will come to rest. If the car is moving and a speed is engaged the small set is driven by the transmission. When the clutch pedal is released the spring forces the plates together again and the clutch revolves as a unit.

The care of this type of clutch is mainly the choice of a proper grade of lubricant. A special light oil can be obtained but it is customary to use cylinder oil, the same as for the engine, mixing it with kerosene in the right proportions. These must be found by trial, but they are usually about half of each. In summer a little more oil may be used and in winter more kerosene. If the clutch slips too much add more kerosene: if it engages too suddenly use more oil. Once the proportions are found, any oil added to replace loss should be mixed in the same proportions.

Engage the clutch gently. This type of clutch is not as rugged as the cone clutch and it should not be subjected to sudden strains. Always make it a practice to release the pedal gently.

Adjust from time to time as it wears. Then tension on the spring will need to be taken up as the plates wear. The adjustment differs with different types but can be learned from the instruction book or the service station.

Clean out with kerosene at least twice a year. Although the case is oil-tight some grit gets in and wears the plates. Remove the plug, drain out all the oil, and fill the usual level with kerosene. Run the engine and work the plates back and forth with the pedal for ten minutes or so, then drain out, fill with fresh kerosene and repeat. Drain thoroughly and fill with the proper grade of lubricant for that season.

Add more plates when badly worn. On an old car the

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plates are sometimes worn so thin that the spring cannot exert sufficient force against them so that they will hold. The addition of a few extra plates will put the clutch back into service.

The troubles of this type of clutch are practically only two: too thin an oil, which makes it fierce (taking hold too suddenly) and slipping. For the first trouble, add more oil, as already explained. If the clutch slips it may be due to one of the following causes: too thick an oil, dirt, weak or broken spring, or worn plates. These should be treated as explained above.

The Dry-Plate Type of Multiple-Disc Clutch

This is similar to the oil type just described and its action may be understood from what has already been said. The only difference is that every alternate plate is lined with brake lining (asbestos and brass wire woven together). No oil should ever be placed on the friction surfaces. The moving parts should be oiled by hand, but that is all. It should be engaged gently, adjusted, and cleaned as described above, but as many of them do not set in a closed case the kerosene will have to be poured through while the clutch is worked in and out. When the lining is badly worn it will have to be renewed.

This type has few troubles, such as spinning and slipping. A spinning clutch pedal is pushed forward. It may be due to the momentum of the plates or a piece of loose lining catching in another plate. This type is usually provided with what is called a clutch brake, a friction device which slows down the clutch or stops it.

In order to apply this braking device the pedal must be pushed all the way. If the gears grind when shifting it may be because the pedal is not pushed far enough. If the pedal has been forced as far as it can go and still the gears grind, the clutch brake may be worn or a piece of the lining may have caught, as mentioned above. In either case the clutch will have to be inspected and possibly removed for repairs.

Slipping may be due to the lining being worn or covered with dirt, oil, or grease. When the lining is worn the rivets bear against the plates and slip. This requires relining. Dirt, etc., can be removed with kerosene.

There have been developed recently several designs of plate clutch which consists of a single driven plate set between two driving plates. It is merely a simplified form of the multiple-disc clutch described above. As the adjustments differ according to the design they are best learned from the instructions issued by the manufacturers.

The Ford Clutch

This is a multiple-disc clutch of the metal to metal type, running in oil. Lubrication is taken care of by the splash system of the engine. No kerosene is needed as the spring is strong enough to squeeze out the oil when the clutch engages. As the plates wear the clutch will slip. The adjustment can be reached by removing the cover of the transmission case. There are three adjusting screws. Bring each one to the top and screw in half a turn, being careful to replace the cotter pin. If the clutch is not tight enough, do the same again. Be careful to turn them all up the same distance or the clutch will chatter.

When the engine is taken down for any purpose it is easy to remove the discs for cleaning, or kerosene may be poured through them without removing. Be careful to remove the drain plug from the bottom of the flywheel housing so as not to flood the engine with kerosene.

New and Useful Automobile Accessories

Spiro Products

Pyramid aluminum matting is being used more and more extensively for interior trimmings of automobiles and taxicabs, as well as for covering running boards and floor boards.

The C. Spiro Mfg. Co. make a specialty of the production of this pyramid aluminum matting in various widths to suit the trade and in long coils or special shapes to order. They report a constantly increasing demand among the car and body builders for this matting which more than justifies their investment in the special machinery they recently completed for producing a matting with perfectly formed pyramids, which make it more durable than the ordinary rolled matting.

This company also manufactures mouldings for binding running-boards, floor and toe-boards of cars and trucks. They are supplying a number of the leading car and body builders and in addition to making the various standard patterns they have designed several new and exclusive types which give the car an individuality and distinction which it would not otherwise possess.

They claim that running-boards and floor boards of a car are such prominent parts of the assembly that their fine finish is vital to sales and, therefore, more attention should be given by the engineers and body designers to details of finish, such as distinctive moldings, and it is along these lines that the C. Spiro Mfg. Co. can co-operate with the trade in a very practical way.

The C. Spiro Mfg. Co. found it necessary in view of increased demand for their Uniq products to enlarge their facilities during the year 1920 and they opened a middlewest factory in Indianapolis in order to be able to give extra good service to their customers in the "automobile belt." Their main office and factory is at 68-72 East 131st Street, New York City, to which all inquiries should be sent. They are prepared to quote on special mountings as well as on standard equipment.

Seelye & Brown Announcement

The Seelye and Brown Advertising Agency announces that Mr. L. O. Haskins, vice-president and general manager of the Powerlok Co., of Cleveland, manufacturers of the Powerlock Differential, has become associated with the agency.

Mr. Haskins is a member of the Society of Automotive Engineers, and he brings a fund of technical knowledge to the agency which will make his assistance extremely valuable in handling the numerous automotive accounts which the Seelye and Brown Agency is placing.

New Truck Manufacturer

Hilton W. Scofield has incorporated a new company, known as the Penn Motors Corporation, for the purpose of manufacturing popular size trucks.

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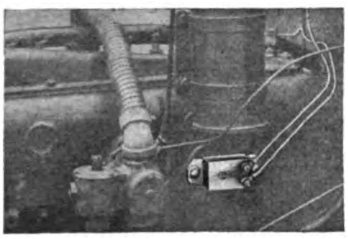
The Protexometer

A new thermostatic electric temperature indicator has been placed on the market called the "Protexometer." It is manufactured by the Protexometer Mfg. Co., Inc., 111 Federal St., Camden, N. J., and is illustrated herewith. The one cut shows

the dial of this device, and the other the manner in which the thermostat is attached to the engine. The dial is attached to the dashboard and indicates the temperature of the engine.

A varying voltage drop in the electrical circuit through the dash instrument is caused when the thermostat is affected by the temperature of the engine. This thermostat is of the spiral type of invar-brass.



When the engine reaches a certain temperature, the thermostatic switch closes automatically, and thereby interrupts the ignition circuit and stops the engine. All danger from overheating is thus prevented. In the event that there is a lack of oil, or in case of a tight bearing, the thermostatic switch is caused to operate by the overheating of the oil by the bearing, and the engine stops.

Steinbrenner Mechanical Carburetor

Coleman, the English manufacturer of mustard, is quoted as saying that "He made his profits not off the mustard used, but off that left on the plates," the waste. The same statement might be made today in regard to gasoline. The high price and shortage is not due to the amount of fuel used, but because of wastage. A large percentage of the fuel waste is traceable to inefficient carbureting devices.

Twenty years experience of the inventor of the Steinbrenner carburetor has produced a device which is said to combine all features necessary in a carburetor; easy starting, flexibility, hard-hitting impulses, reduction of carbon formation, and because of complete combustion, no liquid fuel left in the cylinders and an odorless exhaust which is a true indication of no fuel wastage.

The Steinbrenner carburetor consists of a float chamber, in which the float with its connected valve maintains the fuel level, and the intake tube, cast integral with the float chamber, in which are placed two jets which supply the proper amount of fuel to properly carburete the air. One jet is for low speeds and the other is for high speeds.

The jets are placed in such a position that when the throttle valve is opened for starting, the low speed jet only is uncovered, and due to the high velocity of the air drawn through the comparatively small opening, a small amount of mixture is supplied to the motor.

To increase the power and therefore the speed of the motor, the throttle valve is opened, increasing the passage area, and, therefore, increasing the amount of combustible mixture delivered to the motor. As the throttle valve is opened, the second jet is brought into operation also, delivering liquid fuel in fine streams, which mixes with the air passing through the intake tube. However, as one needle valve regulated the supply of fuel to both jets, the amount of fuel delivered remains constant, but is

split into two fine vapor streams. This arrangement gives a uniform combustible mixture at all motor speeds.

By the proper arrangement of the jets, in relation to the throttle valve, a mixture is obtained that gives perfect combustion, in fact so perfect, that the exhaust is practically odorless, which insures the elimination of carbon formation on the cylinder heads or spark plugs, due to rich fuel mixture.

All parts of the device which comes in contact with the fuel are of brass, the needle and float chamber valves are of high grade steel. Details regarding this device may be obtained from David Reid or 25 Liberty Avenue, Buffalo, N. Y.

Atwater Kent Type N Universal Ignition Coil

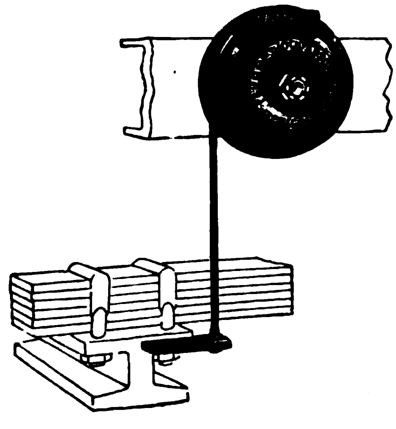
The Atwater Kent Mfg. Co., of 4937 Stenton Ave., Philadelphia, Pa., have announced an addition to their line. This new product will be known as the Type N universal ignition coil, and the manufacturers claim that it may be used on any car fitted with the so-called "single coil unit" system.

The Type N coil is said to give an extremely hot spark, a feature which makes for "snappy" engine action and high gasoline mileage. The insulation of the coil is waterproof and will not break down under even an excessive overload.

The coil is enclosed by a metal casing which protects it against mechanical damage. The condenser is detachable. A universal bracket permits the installation of the coil upon a wide range of car models and at many angles. A special adapter may be had for fastening to curved surfaces such as generator shells, etc.

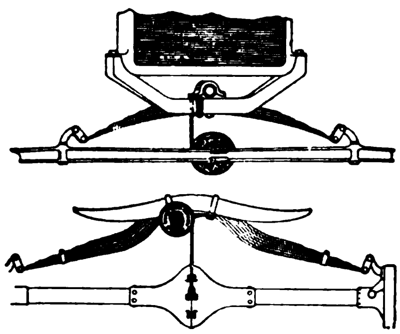
Gilman Shock Absorbers for Fords

A pair of the regular Model C Gilman Shock Absorbers constitute a Ford set. One shock absorber attaches to the inside of the front of axle directly below the crank, the cable end being held by a shackle fitting to the frame. At the rear,



the shock absorber is attached to the spring shackles with the cable end hitched to the differential housing.

Attachment is made in about twenty minutes at the most and without removal or substitution of any Ford part.



The two shock absorbers are said not only to balance the car perfectly but to soften the recoiling movements of the springs to such an extent that a very marked improvement in riding qualities is effected.

Satisfactory performance or money back is guaranteed by the manufacturers who are the Gilman-Davis Company of Chicago, Ill.

Security Tire Theft-Signal

This is a new device for locking the spare tire and rim on automobiles. It is made in four sizes, 3½, 4, 4½, and 5 inch, allowing for variations in the size of tires. Adjustable rubber pads insure snug fit and prevent chafing on tire. Security Spare Tire Theft-Signals, being of case hardened steel, are said to be proof against hacksaws or files. They lock with a non-pickable, dust-proof Corbin lock. The Signal is finished in a bright red.

It is manufactured by the Security Manufacturing Co. of Los Angeles, makers of the Security Auto Theft-Signal, and has the approval of the National Board of Fire Underwriters which gives a saving of 5 per cent on the cost of theft insurance. A reward of twenty-five dollars is offered for the arrest and conviction of anyone stealing or tampering with a tire protected by this Signal.

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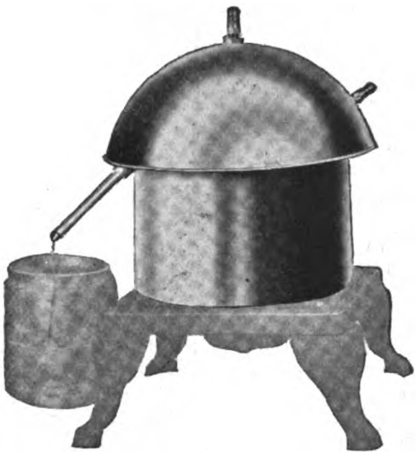
Inexpensive Distilled Water for Battery Service Stations.

A new water still just being introduced to battery service stations is said to solve the problem of supplying pure distilled water at a low cost. The Cleveland Automatic Water Still meets the needs of every service station regardless of size or location.

A special feature of the Cleveland Automatic is that it requires no attention—it feeds itself. No special heating apparatus is required as any type of stove can be used. Neither is running water necessary



for the Cleveland. It feeds itself from a barrel, tub or other vessel.

The capacity of the Cleveland Automatic is one gallon an hour, every hour of the day. Heavy, polished copper construction throughout makes possible the assurance of years of steady service. For complete details write direct to the Cleveland Water Still Co., 480 Prospect Avenue, Cleveland.

H. G. Anscheutz Sales Manager for Paul M. Marko & Co.

H. G. Anscheutz, the new sales manager for Paul M. Marko & Co., Inc., has had a very interesting career and in an interview with him the other day he gave some details concerning it which indicate his fitness for his present high position.

For eleven years he was connected with the Manhattan Electrical Supply Co., and during this time he covered many territories for that company. He was located at different times in the more important cities of the United States as salesman or district sales manager, for a number of years. Then, because of his success in this line, he was made general purchasing agent and worked in that capacity for about two years. After that, and until joining Paul M. Marko & Co., Inc., he filled the role of assistant sales manager.

In his new work as sales manager for Paul M. Marko & Co., Inc., he will have scope to use all the knowledge of sales that he has, because of increased activities of this company in making Marko batteries even more popular than they are now.

Paul M. Marko & Co., Inc., are located at 1402-1412 Atlantic Ave., Brooklyn, New York.

New Hobart Folder

This office is in receipt of a very attractive folder issued by Hobart Brothers of Troy, Ohio, covering their HB generator. This literature sets forth the desirability of making one's own electric lights if electric current is not available or is furnished at nights only.

Pennsylvania Piston Ring Run Night Shift

While many concerns are despairing over the lack of business, decrying conditions in general, it is interesting to note that the Pennsylvania Piston Ring Co., Inc., 203-205 St. Clair Ave., N. E., Cleveland, Ohio, will run a full night shift in the production of Pepco and Instant Pep-Co Piston Rings, beginning May 9th. This Company features the fact that their rings are individually cast.

An announcement of this sort should create a great deal of optimism in the industry, and be an assurance that the business is there for those who go out and get it.

"Dot" High Pressure Lubricator

Carr Fastener Company of Boston, makers of the well known "Lift the Dot" fastener and other fasteners, have for many months been working on a system of high pressure lubrication for automobile chassis. Their system, now developed, is known as the "Dot" High Pressure Lubricating System.

The "Dot" lubricating system is made up of a grease gun, a filler for the gun, nipples to conduct the grease from the gun to the bearings and dust caps for the nipples.

The "Dot" gun is essentially a one-hand operated gun, solidly built as one unit and eliminates the annoying flexible tube so commonly used. One of its principal features is a patented automatic valve which opens and closes when the gun is attached to and detached from the nipples.

In using the gun its nozzle end is placed over the nipple and the gun is then turned one-quarter turn to the right. During the first half of this turn the gun is securely clamped to the nipple and the connectoin is sealed against any amount of grease pressure that may be required for lubricatng the bearing. During the second half of the one-quarter turn to the right the valve in the nozzle is opened, permitting the grease in the gun to be forced through the nipple onto the bearing. It is, however, said that the valve cannot open, until the connection has been thoroughly sealed. Leakage during lubrication is impossible because as the pressure of grease is increased the connection becomes more firmly sealed.

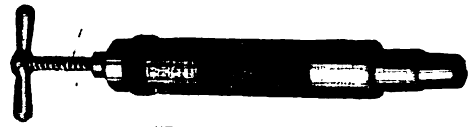
After the bearing has been lubricated the gun is detached by giving it a quarter turn

"Dot Lubricator in Use

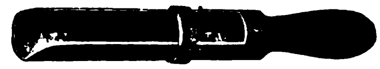
to the left. During the first part of this quarter turn the valve is closed, and then during the second half of the quarter turn the nozzle is unlocked and the gun may then be slipped off of the nipple.

The automatic valve contributes many of the working advantages of the "Dot" gun.

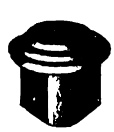
The important advantages of the "Dot" gun itself are well supplemented by the unique patented filler which goes with it as regular equipment. This filler will take the grease from any grease container irrespective of its size and shape and will fill the gun very quickly and cleanly, and without the user's hand touching the grease at all. By means of this filler it is said to take less than one-half minute to fill the gun solidly full of grease.



"Dot" Lubricator

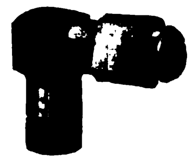


"Dot" Filler



Dust Cap

Straight Nipple



90° Nipple

A New Corporation

Announcement has just been made of the formation of the Western Radiator Corporation to take over the interests of the Hooven Radiator Co., and the B. & W. Manufacturing Co., both of Chicago, Illinois.

The purchase of these two companies give the Western Radiator Corporation one of the most complete lines of radiators made by anyone in the world.

Manufacturing will continue in the magnificently equipped plant at 410-420 N. Western Avenue, Chicago, Illinois, where the B. & W. equipment is being moved. Additional equipment has been provided for increased production of the numerous types in which Hooven Honeycomb, B. & W. cellular type, and Western Tubular Radiators are supplied.

New Sunderland Catalogue

The Sunderland Machine Shops, 21st & Pacific Sts., Omaha, Nebraska, have published the Automotive Motor Service catalogue, which should be in the hands of all owners of garages and repair shops.

This booklet contains a great deal of information which is of help to the garage owner, including as it does sizes of pistons and pins used in the various motor cars and trucks and a great deal of other information. We assume that if recognized garages and repair shops will write to this Company on their business letterheads for a copy of this booklet, the Sunderland Machine Shops will be glad to accommodate them.

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Is this man saving your dollars?

Are you getting 100% service from your oxy-acetylene equipment?

Do you realize that the welding and cutting blowpipes will remake defective castings, rectify shop errors and cheat the scrap-pile?

An oxy-acetylene welded part is not reclaimed—it is *remade* and is ready for 100% service.

Prest-O-Lite

DISSOLVED ACETYLENE

in easily portable cylinders enables you to expand the use of oxy-acetylene, at will, to any department of your factory.

Quickly taken to any job, anywhere, the Prest-O-Lite cylinder supplies uniformly pure gas where and when it may be needed.

And Prest-O-Lite Service operating through forty plants and warehouses insures a constant supply of Prest-O-Lite Dissolved Acetylene at any time, anywhere and in any quantity.

THE PREST-O-LITE COMPANY, Inc.

General Offices: Carbide and Carbon Building, 30 East 42nd Street, New York

Balfour Building, San Francisco

In Canada: Prest-O-Lite Co., of Canada, Limited, Toronto

PW-510-21

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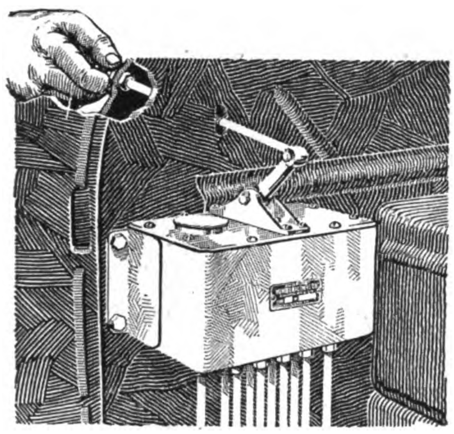
Manzel Mechanical Chassis Lubricating System.

This new system of lubrication is said to enable the driver of a car to lubricate every chassis bearing without leaving his seat at the wheel. It lubricates every bearing, shackle, bolt, reach rod, steering knuckle, etc., in less than three seconds time.

The system consists of a small tank or reservoir fastened to the dash under the hood in which are arranged a number of pumping units, with a tube or pipe leading from each. By means of specially designed distributors, these main pipes are divided at proper places to provide a separate line for each point to be lubricated. A rod for operating runs from the oil tank to a button on the instrument board.

To lubricate the car, it is only necessary to pull the button on the instrument board



and oil is forced under pressure to every bearing on the car. A pull on the lever once or twice a week will keep any car properly lubricated.

The system replaces every oil or grease cup, eliminating the dirty, greasy and disagreeable job of filling and adjusting cups. By its use it is possible to lubricate the car more quickly and easily than to throw in the clutch or put on the brakes. There is no possibility of overlooking or neglecting any bearings, for every one is taken care of simultaneously.

On engines having overhead valves the system is also used for lubricating the valve rocker arm.

It can be furnished for practically any make or model of car and is a product of Manzel Brothers Company, Babcock and Imson Streets, Buffalo, N. Y. This company has made a specialty of lubricating devices for nearly twenty-five years.

The Clover Cylinder Lapping Tool

The Clover Mfg. Co. of Nowalk, Conn., are the manufacturers of the Clover Cylinder Lapping Tool, which is a simply designed, durably made tool that grinds score marks out of cylinders, and brings cylinders that are out of round back to true shape. This obviates the need for reboring and for oversize pistons and rings. This tool may be used in an electric grinder, in a drill press, or may be operated by hand. It is made in four sizes, 3¼, 3⅜, 3½, 3¾ inches. This tool attracted a great deal of attention at the recent Chicago and St. Louis Automotive Accessory Conventions and Exhibits. Full details may be obtained by writing to the manufacturers.

Critz Super Pressure Lubrication System

The Critz Super Pressure Lubrication System offers something new in the accessory field in high pressure lubrication systems. It is applicable to all kinds of motor vehicles, tractors and machinery.

By its use, the makers claim that the motorist or driver can thoroughly lubricate his car in a very short space of time.

The cut shows the Automobile size Critz Lubricator. It is constructed of heavy gauge brass, thoroughly and serviceably made and shows a number of mechanical features noticeable for their ingenuity. The screw and high pressure parts are made of extra grade steel. No unusual features in the plunger mechanism are to be found. The application, however, is direct and according to usual practice. The small diameter barrel makes high prossures easily obtainable and the patented hall check head overcomes all complications. By means of the fittings supplied, every bearing is easily accessible.

This patented head has the additional advantage of making it possible to operate the lubricator with one hand by simply turning the handle to build up pressure in the gun and by slipping the head over the nipple, the bearing is sufficiently lubricated for ordinary purposes.

Where a quantity of grease is required, slip head over the nipple and snap the latch, locking the head to the nipple, allowing as much grease as is required to be forced into the bearing by turning the handle.

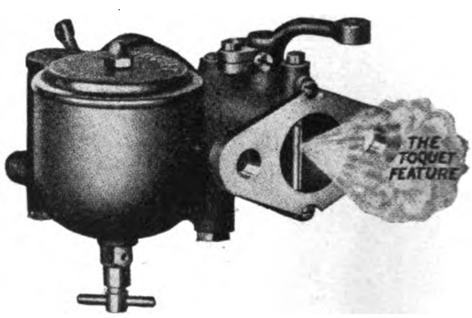
Owing to its mechanical design, the lubricator easily develops a pressure shown on a reliable gauge in excess of fifteen hundred pounds, sufficient to force the lubricant into any cloggea bearing, forcing out the wornout lubricant and replacing same with fresh, clean grease.

The installation is easily made by unscrewing old style grease and oil cups and replacing them with one of the numerous and many styles of fittings, of which there is one adaptable to any bearing location.

The Critz System is manufactured exclusively by the Lathan Auto Supply Company of San Francisco and distributed by them through the United States and foreign countries.

Toquet Perfects New Carburetor

B. L. Toquet, a well known engineer of Westport, Connecticut, has developed a highly efficient carburetor which is now



being sold to Ford owners and dealers. Further Toquet models for various other special installations on other makes of cars are now well along toward completion.

The Toquet Carburetor is the plain tube, fixed adjustment type with no outside adjustment to be distributed. This is said to render it immune from prying fingers inexperienced in carburetor action, and helps the Toquet Company in backing up its product with a sweeping money-back-ten-day-trial guarantee. Every Toquet is made for just one particular make and size of motor and must therefore deliver uniform results.

In principle the Toquet is of the two-jet design, having a main jet for high speed work which accomplishes a completely blended mixture of gasoline and air in exactly correct proportions. The big feature of the Toquet, however, lies in the auxiliary or low speed jet which is, in reality, in action at all motor speeds, and has a very marked influence on the finer atomization of the fuel with its attendant economy and power development.

The Toquet auxiliary jet is located directly in the opening to the intake manifold where it is exposed at all times to the full suction created within the manifold. From the main jet a lower channel delivers the usual mixture of gasoline and air to the auxiliary jet where it is discharged at considerable velocity into the manifold. At the point of discharge, however, the lower stream is met by a blast of pure air, also at high velocity, led down from an upper channel. These two fast moving columns meeting head on at the jet aperture collide with tremendous violence and effectively smash into a completely atomized vapor the tiny particles of fuel carried along by the lower stream.

The Toquet Carburetor is manufactured at Westport, Connecticut, while the general sales offices are maintained at 1819 Broadway, New York City.

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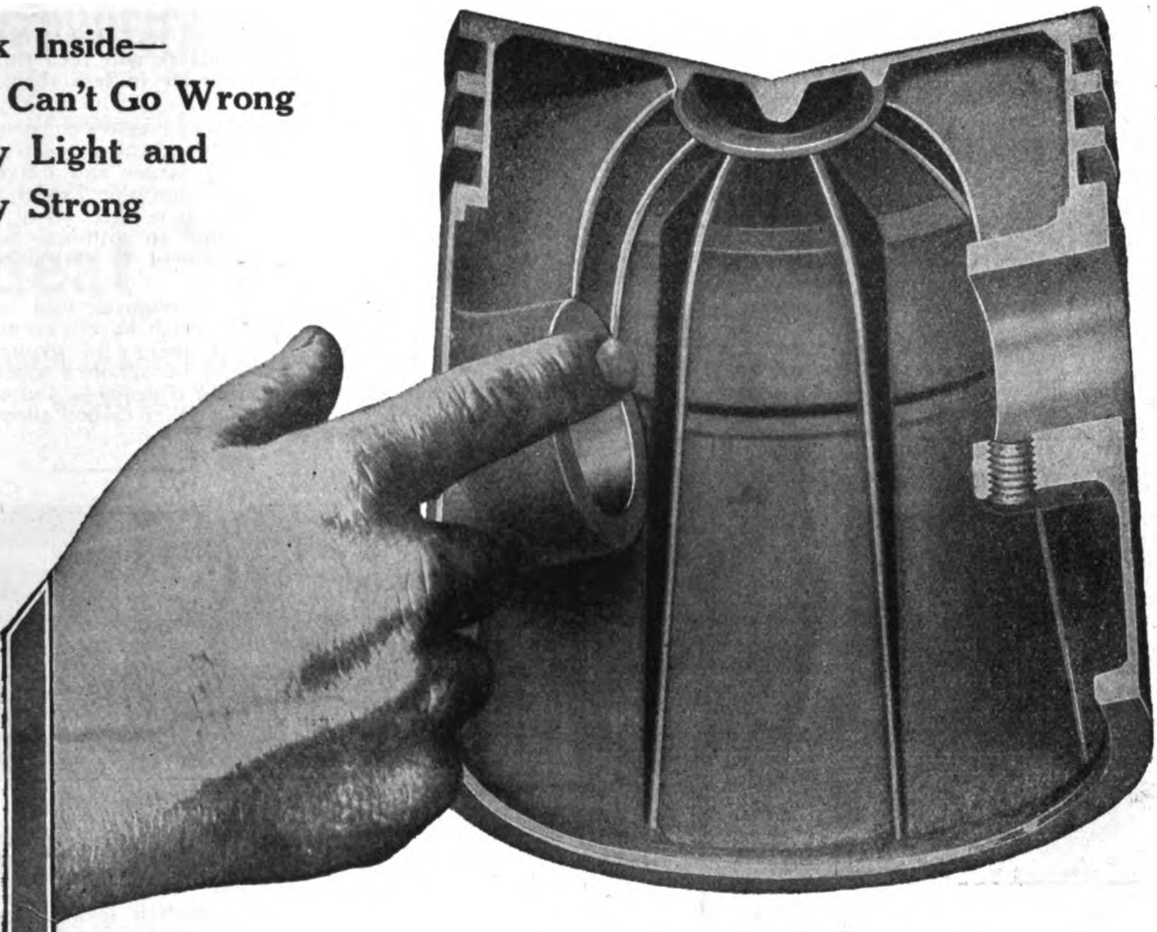
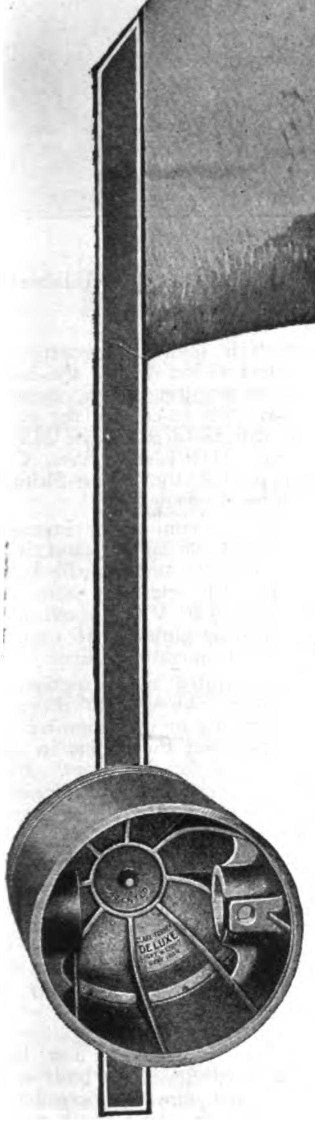
Look Inside—
You Can't Go Wrong
Very Light and
Very Strong





DELUXE
LIGHT WEIGHT CAST IRON PISTON
"The Successful Light Weight Piston" ©

The Piston That Cools Itself

When you have your crankcase drained and fresh oil put in doesn't your motor run sweet for a while—quiet and smooth with more power—but only for a while.

The reason is that the fresh oil with its heavy glutinous body, its viscosity still high, is creating an efficient cushion between cylinder wall and piston. The motor operation is quieted and compression is held, adding power. You are getting perfect lubrication.

But it doesn't last long. The pistons get hotter and hotter and the high temperature begins to melt down the body of your oil—its viscosity is steadily lowered. It no longer can make a perfect cushion and gradually unexploded gasoline mixture leaks by the loose fitting pistons into the crankcase where it thins out the oil still further, destroying its lubricating qualities. Your motor soon becomes the same old noisy piece of mechanism inefficiently lubricated.

In the motor equipped with DELUXE light weight cast iron pistons oil *holds* its viscosity and gives perfect lubrication because DELUXE pistons run cooler and fit closer in the cylinder. The reinforcing ribs, that give this piston such super-strength, rapidly radiate heat away from the head and wall and there is no excessive temperature to break down the body of the oil.

DELUXE cast iron pistons, having the minimum expansion, are fitted very close. This prevents mixture from leaking into the crankcase and prevents oil from pumping into the combustion chamber. Perfect lubrication results at all times and you have a quiet, powerful motor, free from vibration, that is a joy to drive.

DELUXE light weight cast iron pistons not only use less oil but they make oil *last longer*.

Patented and Manufactured by

Clark-Turner Piston Company

Los Angeles, California

For over 900 Makes of Automobiles, Trucks, Tractors, Airplanes, Motorcycles and Marine Engines.
For Sale by all First Class Dealers and Repairmen

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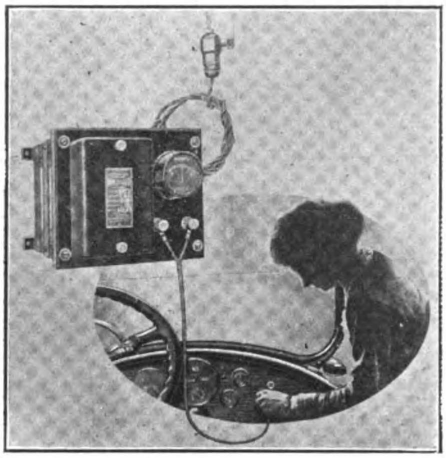
The Homcharger

A very ingenious and timely device for the motorist, has been perfected by The Automatic Electrical Devices Company of 120 W. Third St., Cincinnati, Ohio, which is being marketed under the Trade Name of "Homcharger." As its name implies, the Homcharger is a device for charging the starting, lighting and ignition batteries, forming a part of all modern motor cars, in the motorist's own garage.

This device is a very small and neat affair, measuring 5½ inches by 7 inches by 7 inches, designed for mounting upon the garage wall. It is attached to the nearest alternating current lamp socket by means of an ordinary attaching plug. In order to



facilitate the charging of motor car batteries without tearing up the floor boards to attach charging wires, or without removing the battery from the car, a neat nickel plated receptacle is furnished for mounting upon the dash board which is connected permanently to the wiring of the car.

Thereafter, it is only necessary to insert the charging plug of the Homcharger into this receptacle and the battery immediately starts to charge. The standard Homcharger as designed for individual use, will fully charge an ordinary 6 or 12 volt battery over night, at a cost of but four or five per cent for current. One such charge per week will keep any battery in "the pink" of condition, thereby greatly increasing its life and insuring the user of a quick start, bright lights, and perfect ignition at all times.

As the charging rate automatically tapers as the battery becomes charged, no harm results if the battery should be left connected indefinitely. On the contrary, such overcharging tends to break down any sulphating which might exist on battery plates, thereby lengthening its life.

The Homcharger consists of a step down Transformer and a very simple rectifying "valve" which delivers a uni-directional current to the battery. An Ammeter is furnished which shows the charging rate at all times, together with a 10 foot Charging Cable and Plug to facilitate connection to the battery. The rectifying "valve" which is the heart of the Homcharger is actuated by an entirely new principle which permits of satisfactory operation over a wide variation of frequency, voltage, etc.

But one moving part is used, this being an armature vibrating in a variable magnetic field, actuating two metallic contacts so as to open and close the charging circuit at definite points during each cycle, thereby delivering to the battery, a current of constant polarity. This armature—the only moving part of the entire device, is not subject to any wear and will last indefinitely.

The Homcharger is automatic in every way and entirely fool proof. Regardless of how the batteries are connected, or the charging plug inserted, the Homcharger will automatically deliver current of the proper polarity, thereby eliminating the possibility of reverse charging. Should the alternating supply be interrupted, while batteries are connected, the Homcharger stops, but automatically re-starts as soon as power is restored. As soon as battery is disconnected from the Homcharger, it automatically stops thereby permitting the alternating supply to be left on over an indefinite period without any consumption of current.

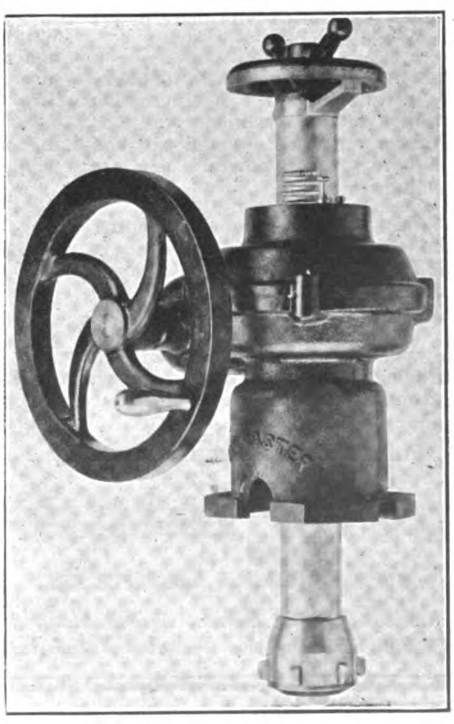
When batteries are disconnected, the charging leads may be short circuited as there is no current flowing through them under such conditions. The secondary of Transformer is entirely insulated from the battery which eliminates all danger of electric shock and makes the Homcharger absolutely safe, even in the hands of a child.

Master Reboring Tool

The Master reboring tool, which is made by H. D. Taylor of 1744 Hibbard Ave., Detroit, Mich., is a practical machine for the small garage or mechanic that does not have reboring machinery of the heavy sort. It is also a desirable machine for the large service station because it will release the larger machinery for heavy work.

This tool consists of a boring head, a driving hand wheel, and a centering block which clamps upon the cylinder head of the cylinder which is to be rebored. The boring head is fitted with six cutters which are radially adjustable in diameter and operated by means of a plate with a spiral raceway or thread. The indexing head, controlling the diameter, is located at the top of the device and graduated to read to 1/1000 of an inch. This obviates the necessity of using micrometers to set the boring tools to size.

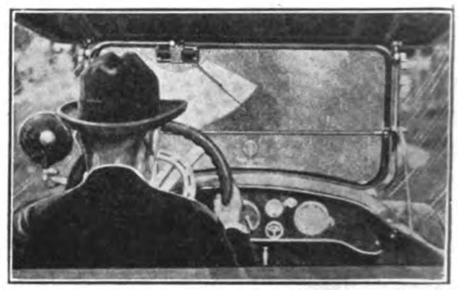
The machine illustrated will re-bore cylinders from three to four inches in diameter. It is arranged to feed 25/1000 ahead for each revolution of the cutter and is geared to the driving wheel with a



ratio of five to one. When operated by hand the cutters will feed through the average cylinder in less than ten minutes.

The tool is of massive construction and is claimed to do just as satisfactory work as the larger and heavier types. It does not require an expert to do the work. After it is once set to the cylinder it becomes an automatic tool which may be operated by an inexperienced person.

The Master reboring tool is made in three sizes, which have a range of from two to five inches in diameter. The machine may be obtained fitted with an electric motor if desired. Cutters can be furnished in either carbon alloy or high-speed steel.



Mayo-Skinner Automatic Windshield Cleaner

A device which is said to automatically provide for perfect vision during the most severe rain, snow or sleet storm, thereby leaving both hands free to control the automobile is being manufactured by the Mayo-Skinner Mfg. Co., 2115 Elston Ave., Chicago, Ill. It is called the Mayo-Skinner Automatic windshield cleaner.

There is a small vacuum motor installed on the frame of the windshield, and it is only necessary to turn the small needle valve on this motor for the cleaning arm, or wiper, to start moving back and forth with the regularity of a pendulum. It can be run at any speed the operator desires.

This cleaner is operated by the suction of the engine, but it is claimed that there is nothing in the attaching or operation of the cleaner which will affect the engine in any way. It is guaranteed for five years. Further information in regard to this product may be obtained by writing to the manufacturers.

The "Ford Special" Battery

"Ford Special" is the latest product of the Westinghouse Union Battery Company of Swissvale, Pa.

Designed to enter the Ford replacement field, which has been estimated at 3000 batteries a day, the Ford Special is built with the habit of cars and aims at excellence which marks all Westinghouse productions.

As its name implies, the battery is made especially for Ford autombiles. The manufacturers have made their objective the most efficient and economical battery that can be produced for Ford users. One of the advantages of the Ford Special is the use of 13 plates, thereby giving greater opportunity for the play of active material in charging and discharging.

Ford Specials are handled by the regular Westinghouse battery distributors and branch service stations. They are being produced in quantity at the Swissvale plant.

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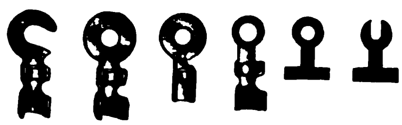

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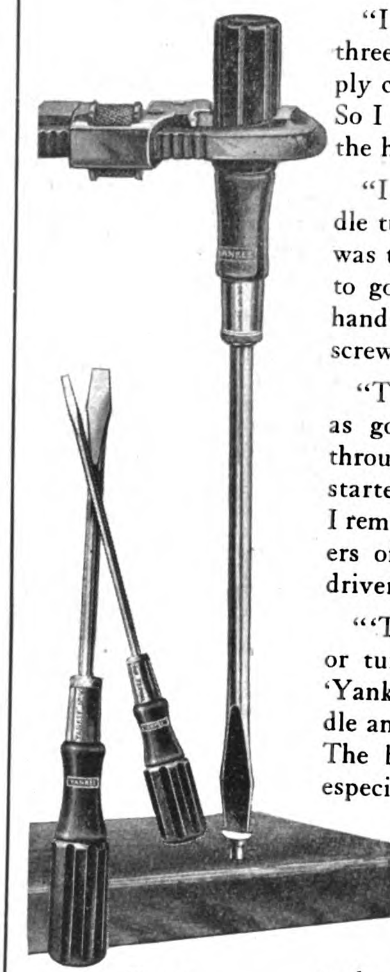
"It was a hard test but the 'Yankee' Screw-driver stood up under it"



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Standard Style. Made in 15 different sizes. Blade lengths, 1½ in. to 30 in.

No. 95
Cabinet Style. Made in 11 different sizes. Blade lengths, 2½ in. to 15½ in.

"I had a job of driving a three-inch screw that I simply couldn't set up by hand. So I put a pipe wrench on the handle and turned.

"I expected to see the handle turn on the blade; but it was the last resort and I had to go through with it. The handle stayed put, and the screw went in.

"The driver was in just as good shape when I got through with it as before I started. It was a 'Yankee'! I remembered what the makers of the 'Yankee' Screw-drivers had said—

"'The blade will not loosen or turn in the handle.' A 'Yankee' device unites handle and blade like one piece. The blade is of steel made especially for the purpose—and every 'Yankee' Screw-driver blade is tested for hardness and temper. It is a thoroughly reliable tool—the highest possible type of plain screw driver ever produced.

"And the 'Yankee' No. 90 made good!"

Dealers everywhere sell "Yankee" Tools

***This book mailed you* FREE.**
Illustrated with over a hundred cuts showing how to do some of the "impossible" jobs that fall to the lot of the motor mechanic.

Some Other "YANKEE" TOOLS

Spiral Screw-drivers	Ratchet Chain Drills
Quick Return Spiral Screw-drivers	Ratchet Bench Drills
Ratchet Screw-drivers	Automatic Push Drills
Ratchet Breast Drills	Ratchet Tap Wrenches
Ratchet Hand Drills	Bench Vises, removable swivel base

North Bros. Mfg. Co., Philadelphia

"YANKEE" TOOLS
Make Better Mechanics

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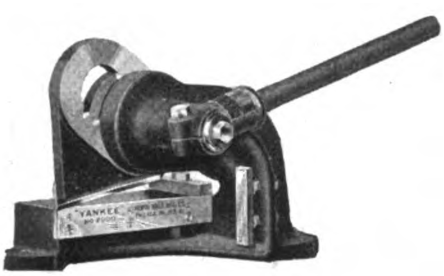
New Cutter for Cutting Brake Lining

The cutting of brake lining—easily, quickly, without waste, and with a clean edge that requires no after trimming—has always been a thing greatly to be desired.

That this can be done is easily proved by anyone who has had the privilege of



cutting a piece of brake lining with the "Yankee" Cutter, the newest member of the "Yankee" Tool family, recently placed on the market by North Bros. Mfg. Co. of Philadelphia.

This cutter, as the illustration shows, is a powerful little machine, substantially built, easily operated and absolutely efficient from every standpoint. It cuts any brake lining up to 6 inches wide and ⅜ of an inch thick. Power is secured through a rack and pinion movement operated by a lever. The bevel and cutting edges of the knives have been given special consideration. The knives are of highest grade steel, carefully ground and fitted. Adjustment screws are provided for taking up the wear or regrinding.

A highly important feature is the arrangement of the guides. There is one on the base and one on the frame which assure the work lining up at right angles to the knives. The one on the frame is made sufficiently long to take care of the brake lining whether it curves up or down as it comes off the roll. The frame is very strong, made of cast iron and finished in dead black.

This cutter is not limited to the cutting of brake lining. It is equally as useful and efficacious in the cutting of belting of all kinds—fabric, rubber or leather.

Saf-T-Visor

Announcement is made by The Toledo Wood Products Co., of Toledo, Ohio, of a new adjustable windshield visor of the non-breakable type, made under the trade name of Saf-T-visor, that will fit the windshield of any automobile manufactured, including

coupes, sedans, touring cars, roadsters, etc., and designed to be sold at a very moderate cost.

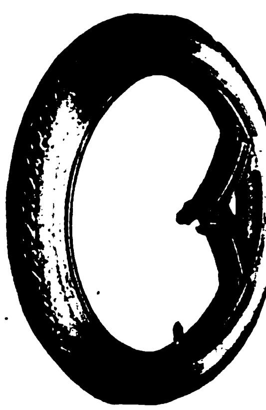
It is claimed by the manufacturers that Saf-T-visor consists of a carefully finished piece of thoroughly seasoned wood of the accurate size, with metal fittings. The visor is heavily enamelled in black on the exposed upper side and in dark eye-resting green on the under side. It is especially light weight and of great tensile strength, assuring lasting service and obviating any chance of loosening windshield glass or pulling windshield frame out of place on account of excessive weight and constant "road jar."

It is further claimed that Saf-T-visor is rattle-proof; instantly adjustable to any desired angle from the seat; has no sight obstructing side brackets or braces; that rain drip is lead to the sides by special construction; that it is easily and quickly attached or removed by anyone and that installation will not damage the finest car; that it does not interfere with windshield or auto top adjustments in any way. All fittings are enamelled with the highest quality enamels.

The manufacturers have produced a windshield visor that possesses every feature the perfect wndshield visor should have. It is an accessory of unusual "Safety First" importance and the makers say it will add neatness, smartness and beauty even to the highest priced cars.

The Collapsible Rim

The Collapsible Rim Corporation, 1201 Gotham National Bank Building, New York City, has announced full production of standard Collapsible Rim in all the popular sizes. This rim is endorsed as being thoroughly practical, and scientifically correct.



It operates in an entirely new manner and is said to relieve the car owner of all the annoyance that follows tire trouble.

The Collapsible Rim is made without hinges or any working parts, and there is nothing to wear out or get out of order. When the car owner experiences tire trouble he removes the tire and rim, gives the rim a sharp bend and unlocks it.

The removal of the tire is then accomplished without the aid of irons, screw drivers or any of the other tools that the average owner carries with him for this purpose. After repairs have been made the tire is slipped over the rim—a very simple operation—and the rim is securely locked by a slight pressure of the unlocking joint and snaps back into place.

Besides making tire changing quick and easy, the manufacturers claim that tire manufacturers are especially interested in the rim because it will prolong the life of tires. One tire manufacturer is credited with stating that there would be less blowouts if the car owner were able to remove his tire without the use of dangerous irons.

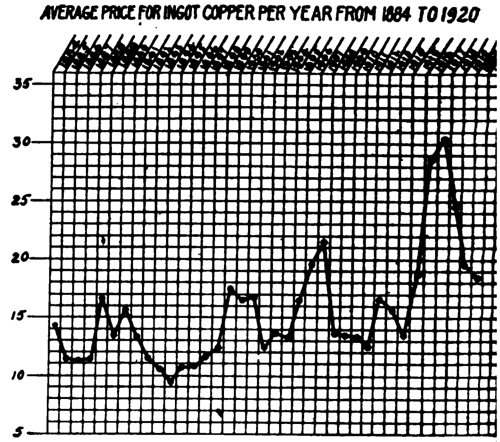
Pounding the sides of the tire with heavy irons to force it back on the ordinary rim is said to be the cause of more blowouts than any other action.

Prices of Ingot Copper

C. C. Secrist, Sales Manager of the Victor Manufacturing & Gasket Company of 5750 Roosevelt Road, Chicago, Ill., one of the largest users of copper in the country, has prepared the chart reproduced below showing the average price of ingot copper for the last thirty-seven years. Mr. Secrist has carried his investigation further and prepared similar charts showing the average price per month for each of the thirty-seven years.

The Victor Company, according to Mr. Secrist, uses 5,000,000 pounds of copper annually. In spite of increases in the cost of copper from 1913 to 1917 of more than 100%, the increase in the price of Victor copper-asbestos gaskets has been very moderate and due in large part to the increased labor costs.

AVERAGE PRICE FOR INGOT COPPER PER YEAR FROM 1884 TO 1920



Greenfield Tap and Die Purchases Greenfield Machine Co. and Morgan Grinder Co.

At a meeting of the Board of Directors of the Greenfield Tap and Die Corporation, held Thursday, June 9th, it was voted to purchase the entire capital stock of the Greenfield Machine Company, Greenfield, Massachusetts, manufacturers of Cylindrical and Universal Grinders, and the Morgan Grinder Company of Worcester, Massachusetts, manufacturers of Internal Grinders.

The combination of the Morgan Grinder Company and the Greenfield Machine Company, together with the machines now produced by the Greenfield Tap and Die Corporation, will constitute the Machine Division of the Greenfield Tap and Die Corporation.

The Greenfield Tap and Die Corporation will operate both plants in their present location, although eventually the Worcester plant will be moved to Greenfield.

The organization of both plants will remain the same:

The Morgan Grinder Company, Ralph L. Morgan, president; L. M. Crittsinger, treasurer; Charles E. Hildreth, general manager. Greenfield Machine Company, E. F. Smith, president; Joseph G. Stevens, treasurer.

New Catalog

The Continental Car Company of America, whose offices and works are at Louisville, Kentucky, have recently published a catalog of Ford Commercial Bodies. These catalogs are for free distribution to Ford dealers anywhere. Readers who are interested should write to this Company for a copy.

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UNIVERSAL BATTERY CLIPS

Offer a quick and ready means of connecting storage batteries for charging. Simply fit your connecting cords with these clips and snap them over the battery terminals.

No. 21-A, lead coated, 1½-inch spread of jaws. Sample mailed postpaid for 20 cents in stamps.

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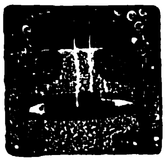

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A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 71-73 Murray Street - New York City

Entered as Second Class matter January 15, 1921 at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

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Automobile Dealer and Repairer

REGISTERED IN THE U. S. PATENT OFFICE

VOL. XXXII. No. 1 | SEPTEMBER, 1921 | PRICE { 15c per copy / $1.50 yer year

When O'Reilley Reminisces—

FRIEND O'Reilley was propped back in his corner, near the washstand, sitting on a much abused chair, when I found him with the idea of getting a story from his wise old brain. I have been seeking quite a bit of him since he gave me the one about car washing, which you will remember was in the April issue. Evidently O'Reilley still remembers this story as is evidenced by his greeting.

"I'll be up to your office and put a bit of 'ell into your artist next week if you let him print my name with only one L in it agin, remarked O'Reilley, as he pushed forward a box for me to sit upon. (Our artist, be it remarked, is always getting me into trouble. In April he left one of the "L's" out of O'Reilley's name and O'Reilley won't let the matter rest.)

"An' I'll give ye another tip, ye can tell that same artist, with me best compliments, that if he draws another picture of me and my family, he can add another face, makin' nine, all told."

Having complimented O'Reilley upon his partriotism and inquired solicitously after the family, I asked him what he could tell me about cars in general, some good suggestions for a story. I can't reproduce his brogue, so I won't even try, except where it seems necessary.

O'Reilley Makes Ready

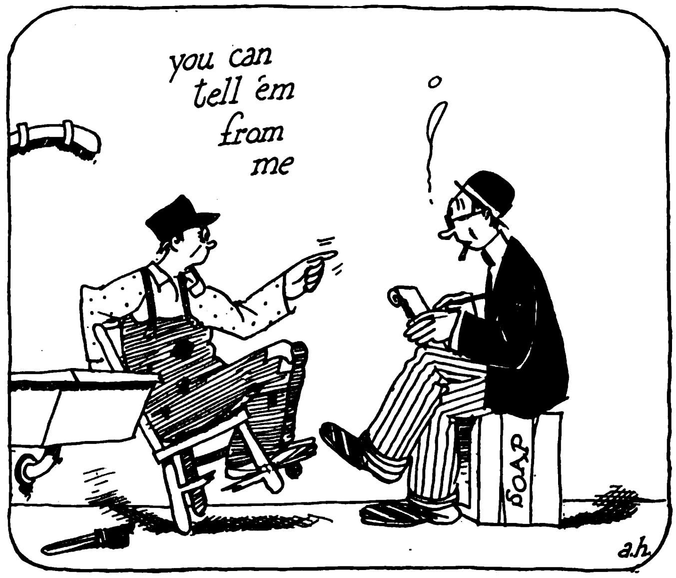
Friend O'R filled up his pipe and when it had started to produce sufficient smoke for satisfaction, tilted his chair at a still more alarming angle and pointed his finger at my nose. Now there is something *convincing* about that finger, when pointed directly at one's nose; it makes me think of one of those sawed off shotguns and I'm always worried for fear that it might explode. O'Reilley knows this and when he wants to emphasize something important he wiggles it up and down just as though it were a Colt automatic in full swing.

"Ye can tell 'em from me," he said, wiggling his finger violently, "that the wisest of 'em are the biggest fools. The more they know, the foolisher they get when it comes to running ortomobeels." (I spell it just as he said it.)

"Fellow in here only yesterday, twelve cylinders, tortoise shell glasses, limousine body with orkids in it, high forehead and big nose, said he was efficiency expert over at the factory and looked it, said that the car was all to the merry except that one of the cylinders wouldn't work. Said that he had gone all over the machine in his most systematic way and knew that everything was O. K. but still that cylinder wouldn't go. Wanted us to make a 12 cylinder car out of it, as nature intended.

"One of our mechanics puttered around for the best part of an hour and couldn't find anything wrong. I guess everyone in the shop finally took a whack at it, including the boss, but they couldn't seem to find that missing cylinder.

"While they were standing around gassing about the puzzle, I kinder wandered over to the car to see if I couldn't show them a thing or two. You remember when



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I told you about washing a car, how you must keep the water away from the wiring? Well, I thought mebbe water might be causing the trouble, and that's what I looked for. I says to myself that mebbe a drop of water had worked inside the tube which carries six of the spark plug wires and was shorting out one of the wires. Mebbe the missing cylinder wire was on the bottom and so was the only one which was shorted.

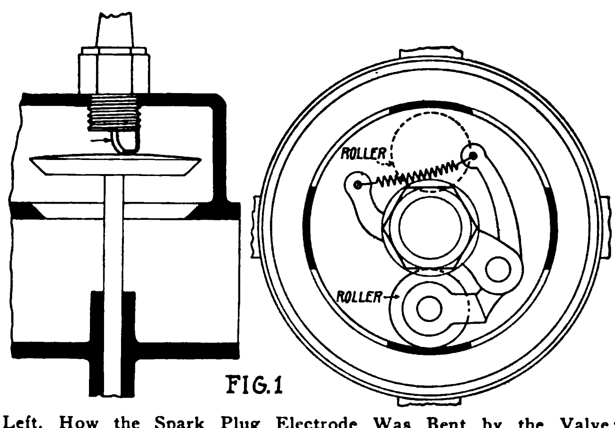
"And so, while no one was looking, I yanked the wire out of the tube and then connected it with the proper plug again. The boss thought he would give her one more trial before he quit and started her up. Go? Say, that engine ran as smooth as a clock without a single miss, so it was up to me to play the shrinking violet and tell them what the trouble had been.

"We looked over the wire carefully and it seemed to be all right. It would carry the current all right, most of the time, but when we put it against the tube or the engine, then it wouldn't always work. One of the boys split the insulation open with a sharp knife and found that the rubber had rotted away at one point, but the covering seemed all O. K. We doped out that the spark would short to the tube rather than jump across the plug when the engine was running.

When Everything Seems All Right

"And I guess that this will make a good story for you; tell the boys about troubles in a car when everything *seems* to be all right. There's always a reason why an engine stops but it's the divil's own job, sometimes, to find that reason if everything *looks* all right."

With this introduction we will listen to the rest of O'Reilley's hints. His garage is a busy one and O'Reilley has an absorbing mind, much like the sponges which he uses for washing cars. Possibly you are, or have been, worried about some trouble with your car; if so read on,

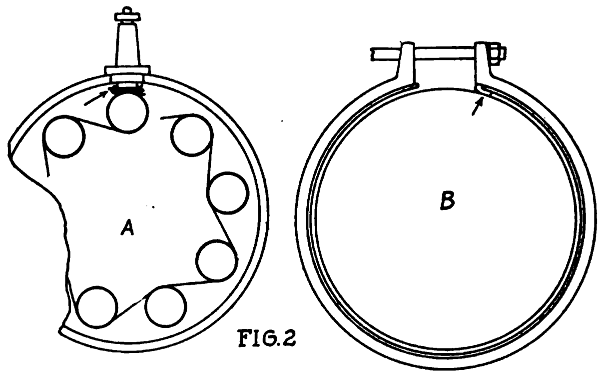


At Left, How the Spark Plug Electrode Was Bent by the Valve; At Right, What Happened When the Timer Spring Weakened

maybe O'Reilley has solved your problem for you. In some cases we have seen fit to illustrate the subject and have added to O'Reilley's discourse the reference figures.

"The Boss owns a dandy little racing car" explained O'Reilley, "and he had the boys in the shop build it from a stock model that wasn't intended to run more than 60 miles an hour. They put in a larger cam-shaft; counter-balanced the crankshaft; re-bored the cylinders and put in larger valves after increasing the size of the parts and seats. The day that they finished the job we held a regular picnic around here and the Boss had his new car christened with a bottle of wine, though I'll say it was a shame to waste the stuff.

"When all was ready the Boss pushed down on the starter pedal and the thing commenced to churn but never a chug did it give. They cranked the car from the front when the battery gave out and it wasn't until every last man in the shop had spent a day on her that they found the trouble. And you'd never guess what the trouble



At Left, Arrow Shows Where the Waste and Dirt Collects in a Ford Magneto; At Right, The Turned Over Lining Which Ran the Ford Backward

was! They found a good spark at the plugs and the engine was getting the gas and by all rules the thing should have run, but it didn't. They put in a new set of plugs, and never a puff could they get.

"Well, to bare the little secret, I'll tell you. The spark plugs were located directly over the side of the intake valves and when they put in the oversize valves, with an extra high lift, the valves would hit the center electrodes of the plugs and bend them just enough to short circuit them or spoil them. And when you put in a new set of spark plugs you don't expect to find them all busted before the engine starts, now do you?" (See Fig. 1 at A).

" 'Twas only last week that one of the boys, who knows the game pretty well, called us on the 'phone to ask for help. We had just had his car in the shop for a few repairs and to save time for him, charged the battery. He came for the car late in the afternoon and we jollied him a bit because he was taking the Boss's daughter out for a ride and to a dance. They got to the dance all right and he parked the car out front but when he started for home, along about midnight he couldn't even turn on the lights. At first he thought that someone was playing a joke on him and had 'fixed' the wiring, but he checked every connection and wire over as well as he could, with only a couple of boxes of matches to furnish the light. Along about one o'clock he called our night man on the 'phone and asked for help. The night man went out in a car for the young lady but wouldn't take him back to town, told him to walk and air his brain, then mebbe he would find the trouble before morning.

"I guess the walk didn't help, at any rate we had to go out to the town club to fix the car. What was the trouble? Nothing much except that the battery terminal had worked loose on the post just enough to permit the vaseline, which we use to coat the terminals with, to

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work between the post and the terminal. This formed a good insulator. As long as the car was running, the generator kept the current up but when the engine stopped the vaseline soon worked over the connecting spot." (See Fig. 3 at B.)

"Some people say that seeing is believing, but I don't agree with them. For instance, if I should see a purple elephant with pink ears and a celluloid collar around his neck I wouldn't necessarily believe my eyes, but I'd try to think of what I had eaten or drank a few hours previously. It's the same way with an automobile, you mustn't believe all you see, but you must use your judgment and other senses as well. Even if a connection *looks* all right, try it with your fingers to be sure.

"And this puts me in mind of the trouble we had with a closed car last Spring. The engine ran fine until the car came to a right-hand corner, then it would skip or stop altogether unless the car had speed enough to make the turn. A left turn wouldn't bother it a bit. That car had what the ladies would term 'temperament' and if I get the meaning of the word, entirely, *I'd* say it *had,* because it caused plenty of *temper* around here. It got so finally that the owner wouldn't go any place, so they say, unless he could get to it by always going straight ahead or turning to the left. We put the Summer body on the chassis in place of the closed one and didn't have any more trouble.

What Was Wrong with the Wiring?

"During our spare time, off and on, we all looked over the wiring on the closed body (that's it over in the corner there)."

O'Reilley eased himself out of his chair and took me over to look at the "temperamental" body. Pointing to a wire which ran from the junction box, along one of the sills and up to the junction box behind the dash he told me that there was where they finally located the trouble. The wire appeared to be perfect but a bright mechanic had finally found, by testing every fraction of an inch with his fingers, that the wire was broken inside the in-

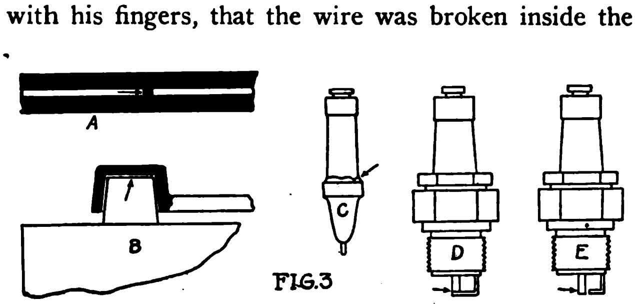
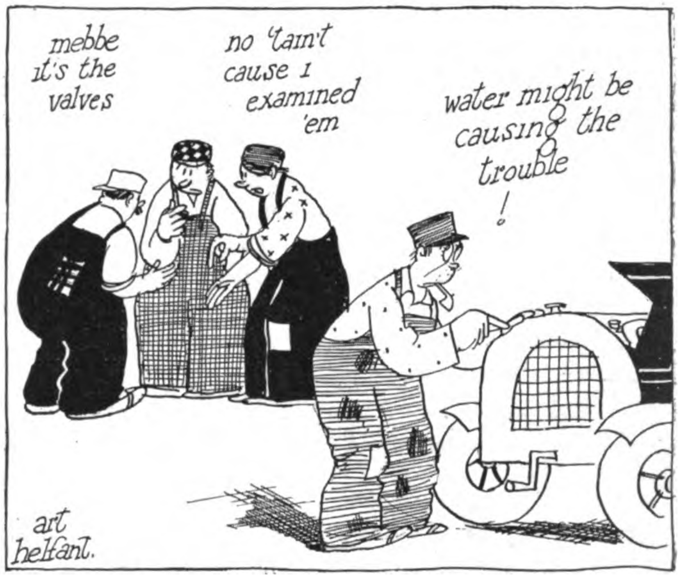


FIG.3
Various Hidden Troubles Referred to in the Text

sulation. (Fig. 3 at A.) I suppose that the wire, under normal conditions, would remain connected but the turning of the car to the right would put a strain upon it and pull the ends apart, thus cutting off the ignition current.

When we had returned to our respective seats again O'Reilley with various chuckles recalled what he termed a "steady customer."

"We had one fellow," he said, "who was always getting into trouble and one day he came in to fuss around his flivver. He puttered around the thing for awhile and finally started off. We watched him go up the road," (one can see for nearly a mile up the street). "He drove along about 300 yards and his car stopped. He cranked and cranked and finally she started again and ran about the same distance, then stopped. He kept this up until



he was out of sight, 300 yards, then a spell of cranking and then 300 yards more or less.

"In about half an hour one of the boys spied his car in the distance coming back, 300 yards at a time and then a spell of exercise and profanity. When he had finally cranked the thing back to the garage he was ready for the hospital. Wonder of it was that he hadn't drowned because the sweat was running down so fast that he looked like the lady under the fountain in Central Park.

"The gentleman had put in a new set of spark plugs which was all right, but they were so fixed that the center electrode stood directly over the wire from the side. When the engine was heated the electrode would expand and cut the gap down until the spark was not fat enough to ignite the mixture." (See Fig. 3 at D).

"We didn't find this trouble right off because the plugs seemed all right when they were cool. But some bright guy in our establishment put two and two together and reasoned out the answer. If the engine ran when cool and didn't stop until it was hot, and then wouldn't run until it was reasonably cool again, then it must be something to do with the heat. He checked over everything else and tried different plugs which cured the trouble. Plugs should be adjusted so that the expansion of the electrode will carry them past each other rather than towards each other." (Fig. 3-E).

"And now that we are on the subject of plugs I might mention a fact that often gets past the ordinary driver. If you will take the porcelain center from a plug you will find that it will stay in one piece, even if it is broken, because the nut on the end of the center electrode holds it together. If the porcelain is cracked, as it often is even if you can't see the crack, the best way to locate the crack is to take off the nut on the upper end and give a slight pull to the porcelain. The insulation usually cracks

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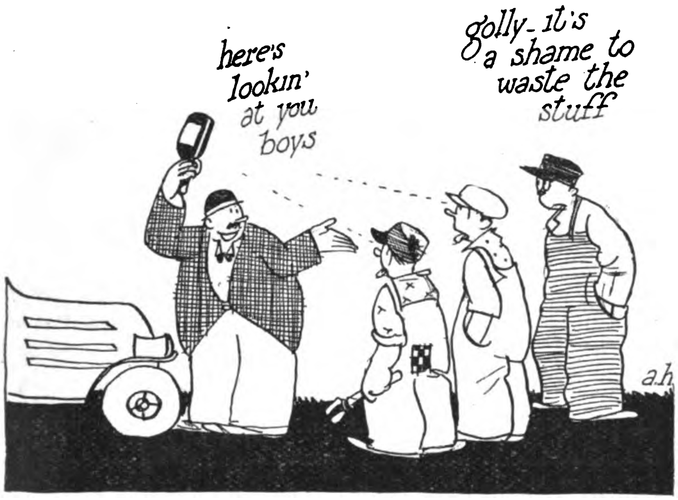
just above the largest part where it is held into the jacket." (Fig. 3-C).

"That same fellow I was telling you about, who has so much trouble, put on a set of spark intensifiers about a year ago. First off, they seemed to help the engine, at any rate the engine ran better with them than it did without them. He kept them on the car without looking at them until a short time ago. At that time he complained that he couldn't start the engine without spinning it for a minute or so. He isn't over strong and spinning a four cylinder Ford car for a minute at a time is a man-sized job. One of our men helped the poor fellow out by showing him that the points in the spark intensifiers had burned off so that the emergency gap was too wide. A pair of pliers and a screwdriver adjusted the points and now he doesn't spin the engine.

"Someone says that a Ford car is something like an old



fashioned hat rack,—there's always a place to hang something on. I don't know about this statement, but I do know that there is always a chance for trouble to hang on. We've had lots of trouble with Ford magnetos that wouldn't give current. Mostly we find that bits of waste, dirt or ravelings from the brake bands, work between the magneto outlet plug and the plate on the top of the coils." (Fig. 2-A.) "I'd advise every Ford owner to have a set of dry cells in his car all of the time. If his magneto goes wrong he can run on the cells and when he gets time to remove the magneto terminal plug he can do so and clean it off.

"Another trouble we have with Ford cars is in the timer. I remember one Ford car that caused us a few nights loss of sleep. It would run on two cylinders only, at low speeds, but hit on all four at high speed. Naturally we thought that the trouble was in the carburetor but we finally found that the timer spring was weak. The roller arm would contact against the two lower segments, but when it rolled to the top it would fall away. At high speeds, though, the roller would throw against the contacts all around." (Fig. 2-B).

"What was the funniest thing you ever saw along this line of idiosyncrasies?" I asked O'Reilley.

"Idio—an' what may that be? I ain't never heard tell about wan o' those idio-what-do-you-call-'ems before. Oh yes, you mean cranky actions! Now I get you. Well, let me think for a bit."

O'Reilley's thought apparatus, at this point, seemed to need fumigating for he stoked up the old pipe and blew out a few huge puffs of smoke which reminded me strongly of a locomotive with a new shovel full of soft coal, both as to denseness and odor.

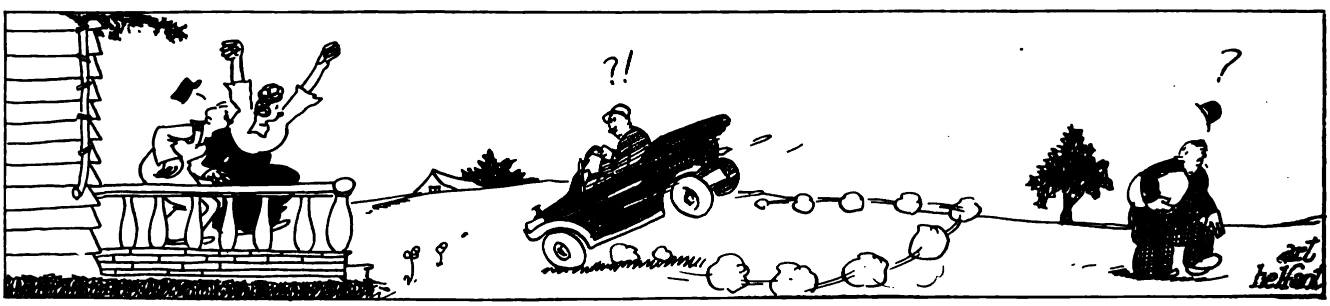
"Speakin' of funny things, did ye' ever see wan of those movin' pictures where they run the picture backwards and the automobile does the shimmy with its hind wheels in front?" I acknowledged the humor of the situation and O'Reilley continued; "Well I seen one onct and it wasn't half as funny as the time when the thing actually happened before my two eyes.

O'Reilley's Brother-in-Law

"My brother-in-law, an he's the funniest Irishman you ever saw, bought a 1914 flivver about a year ago and tinkered her into shape so that she would run most of the time. Wan night he came over to the house in the car to take us out for a ride, me and the missus.

"We were sittin' on the front steps when he came bumping up the street in fine style. I guess he wanted to show off a bit, for he waited until he got opposite the house and then he made a fine turn which landed him in front of our door. The flivver had hardly stopped when it began to back up again, trying to go back over the same way it came.

"He made the back turn as neatly as you please, but goin' faster every minute, he kept right on makin' turns until I lost count and then he managed to get the wheels straight. Right over our flower bed he came and missed our step by about six inches, going backwards all the while. Went around the corner of the house into the alley and brought up against the wall at the rear with a bang that you could hear for a mile. He started out of the alley again and was almost back to our flower bed before he finally managed to stop the engine.



"We had to push the car off the lawn, ruining the other two flowers which we had grown with great care. We didn't take our ride in *that* car *that* night, mostly because we couldn't seem to release the reverse gear.

"When he pulled the transmission cover off, he found that a piece of the lining from the reverse drum had turned over and wedged between the drum and the band. Of course this locked the thing into reverse and that was why he made all of those pretty reverse curves." (Fig. 2-B). "The missus and me could see how funny it was, but my brother-in-law said there wasn't anything funny in it at all.

"And now I guess you've got enough out of me for your story."

But as I turned to leave, O'Reilley detained me with that same big pointing finger;

"Just wan minut, now, before you go, you tell that artist from me, that he niver saw an Irishman smoke a pipe the way he had me pictured in April. A good Sinn Feiner always puts the top of his 'tee-dee' on the bottom."

And so I left O'Reilley with full assurance that my artist would do justice to the family, both as to numbers and to habits.

Charging Storage Batteries

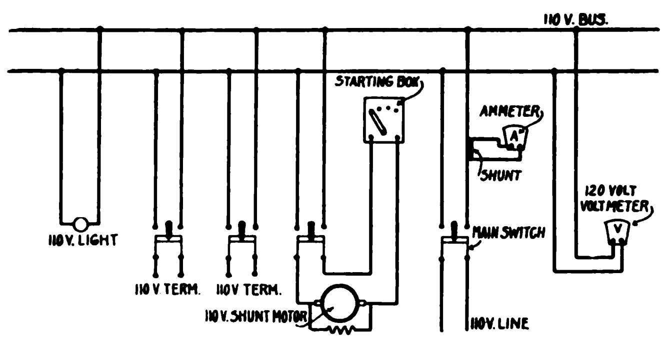
The Various Type Batteries and Improved Methods for Charging Them

By A. P. Palmer

WITH the Constant Current method of charging which is usually used, the current rate in amperes is kept as nearly as possible at the normal charging rate of the battery until the battery voltage reaches a definite value. For the Edison battery this is the point at which the charge is terminated, while for a lead battery the charging current is reduced at this point to one-third or one-quarter of the normal rate and the charge continued until the battery voltage reaches the full charge value.

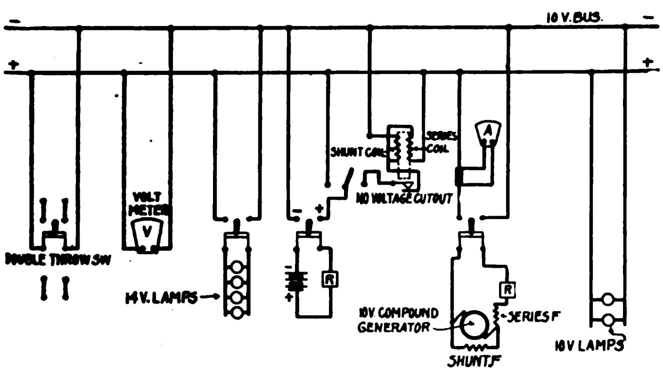
The constant rate is secured by means of an adjustable rheostat is also used to reduce the charging current to the resistance being cut out from time to time as the battery voltage rises. In the case of the lead battery, the rheostat is also used to reduce the charging current to the finishing rate and to maintain it at this rate until the charge is completed.

For constant current charging of a lead battery the line voltage must be at least 2.6 times the number of cells connected in series and for an Edison battery at least 1.9 times the number of cells in series. With the modified constant potential, or fixed resistance method of charging, a fixed resistance is connected in series with the battery which is then connected to a constant voltage circuit.



110 Volt Motor Panel. (Front View)

Owing to the fact that the battery voltage is low at the start and high at the finish the charging current tapers from a high rate at the start to a low rate at the end of the charge. The resistance is so proportional that a charge by the modified constant potential method gives the equivalent of a charge by the constant current method. In the case of lead batteries the value of the fixed resistance is so chosen that the charge is finished at a rate not in excess of the finishing rate of the battery.



10 volt Generator Panel. (Front View)

With Edison batteries the time required for a full charge by the modified constant potential method is the same as the time required by the constant current method. With lead batteries, however, the time required for a full charge by the modified constant potential method is dependent upon the relation between the line voltage and the number of cells in the battery. For lead batteries it is desirable to have a line voltage of between 2.4 and 2.6

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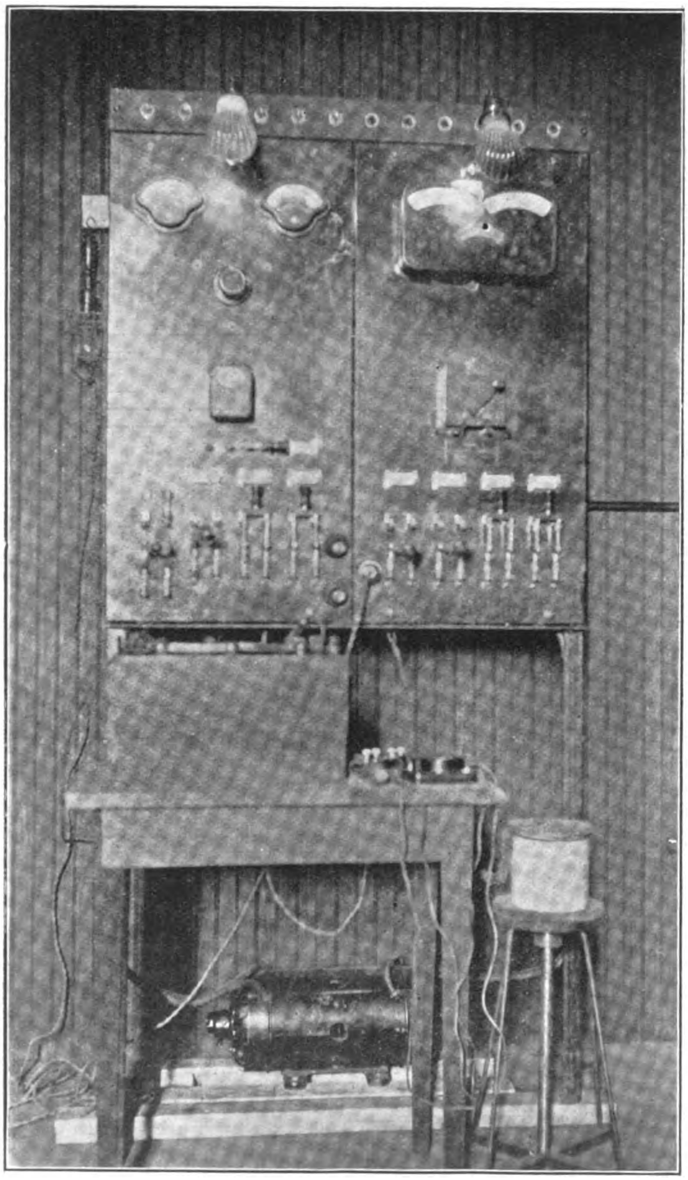
volts per cell. Higher voltages may be used but the efficiency of the charging apparatus is thereby decreased and the minimum time in which the charge can be completed, correspondingly lengthened.

Another method of charging, known as the Straight Constant Potential method, requires a line voltage, the particular value of which depends upon the battery to be charged. For lead batteries a line voltage of 2.3 volts per cell is needed while for Edison batteries the voltage must be 1.7 volts per cell. Under these conditions no resistance whatever is necessary and consequently no power is lost in the charging apparatus. This method can seldom be used, however, because of the difficulty of obtaining the correct line voltage because of the serious fluctuations in charging current which result from relatively small fluctuations in line voltage, and because of the abnormally large capacities in charging apparatus and conductors necessitated by the extremely high initial charging rate obtained.

The constant current method is generally used in public



Photograph of Mr. Palmer's Experimental Charging Panel Mentioned in the Article

garages and large plants where competent attendance is provided during the charging period. The chief advantages of this method are (1) the rheostat can be adjusted to give the proper charging rate regardless of the fluctuations of line voltage. (2) No excessive capacity of conductors is required to take care of the high currents of only short duration; and (3) the demand on the power line is more uniform than with any other method.

The modified constant potential method is rapidly gaining favor owing to the fact that no attendance is required during the charge. This allows not only a possible saving in expense, but also the elimination of the human element in the regulation of the charging current with consequent assurance of proper treatment of the battery.

The diagram herewith shows a charging outfit for charging storage batteries at a different voltage from that of the supply without the usual waste of current in resistance. This is accomplished by means of a motor generator set, the motor being driven from a 118 volt line and the driven generator supplying the batteries at 10 volts or less.

A starting box is used in starting the motor to prevent the inrush of current and an ammeter in the main line indicates the amount of current used. A voltmeter across the line indicates the supply voltage.

A small resistance in the generator circuit regulates the voltage and an ammeter registers the current consumed by the battery. The generator is compound wound the series field tending to maintain the voltage with the increase in load. A resistance of about one-half an ohm is placed in the battery circuit to prevent too much current flowing through the battery.

Automatic Cut-Out Used

An automatic cut out is also placed in the battery circuit. In case the current flowing through the cut-out to the battery should cease, the battery would discharge and ruin itself, if it were not for the cut-out which immediately breaks the circuit when the current flows through it in the opposite direction. This is accomplished by means of a shunt coil of high resistance which closes the circuit when the current flows in the proper direction and a series coil which neutralizes the shunt coil when current flows in the reverse direction. The two windings act upon a free moving solenoid core connected to the plunger rod which operates the switch contacts. The amount of reverse current required to open the switch is very small and the contracts operate with positive action.

Another switch connects a number of 14 volt lamps to the generator bus bars and these may be thrown either upon the generator as a load or upon the battery. A voltmeter connected across the bus bars of the generator indicates the voltage of the circuit charging the battery.

A table is given showing the current taken from the line during the charging of a 3 cell Exide battery and it will be seen to be less than half that consumed by the battery. The amperes under motor in the table is the current flowing from the line while the amperes under generator show that consumed by the battery.

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GENERATOR			MOTOR		
Condition of battery	Volts	Amps	Battery Volts	Volts	Amps
Dead	10.75	6.75	6.25	117	2.2
Half charged	10.50	5.00	6.75	117	2.0
5/8 charged	10.75	5.00	6.9	119	1.9
3/4 charged	10.75	5.00	6.9	119	1.9
7/8 charged	10.00	5.00	6.9	116	2.0

THE WRONG MAN

A colored gentleman of Tennessee named Joshua, was arrested for selling corn whiskey, and when he was brought up for trial, the judge smilingly asked him: "What is your name?" "Joshua," he answered. "You don't happen to be the Joshua that made the sun stand still, are you?" asked the judge. "No, sah," replied the colored gentleman, "I'se de Joshua dat made de moonshine."

A B C of the Automobile

How the Differential Is Constructed and How the Gears Are Adjusted

By R. A. Chandler, S. A. E.

WHEN the power leaves the engine it is transmitted through the following parts: the clutch, the gearset (also called the transmission), the universal joint (one or two), the drive shaft (now called the propeller shaft), the differential, the axles, and the wheels. The whole rear assembly, comprising the differential, axles, and housing, is called the rear end. This we shall now take up in detail.

The purpose of the differential is to deliver power to both wheels whether they are turning at the same or different speeds. Another way of stating it is that the differential allows the rear wheels to travel at different speeds while delivering power to them. When the car is moving straight ahead the wheels revolve at the same speeds but when the car turns to one side or the other the outside wheel must speed up as it has a greater distance to go. The inside wheel must slow down in proportion.

There is some controversy as to whether the differential delivers equal power to the two wheels at all times or delivers it in proportion to their speed. At first thought it would seem that the wheel which turns faster should get more power, but on second thought we realize that it has less resistance. The inside wheel is held back by road resistance, which requires a certain amount of power to overcome. The outside wheel meets less resistance but it is travelling at a higher speed. So they require equal power to drive them.

An Analysis of the Driving Forces

This can also be shown mathematically by an analysis of the driving forces. So the beginner is cautioned not to believe the uninformed who state that the inside wheel does the driving while the outside one runs free. This is possible with certain constructions but is not true of the ordinary differential.

The parts of this type, according to the S. A. E. nomenclature are: the side gears, the pinions, the pinion shafts or spider, the case, and the drive bevel (or worm) gear. The side gears and pinions are also bevel gears in the type in present use. The side gears drive the axles and are two in number. The pinions mesh with these and drive them. They are three in number in small cars and four in large ones. They are driven by the spider which is clamped between the two halves of the differential case.

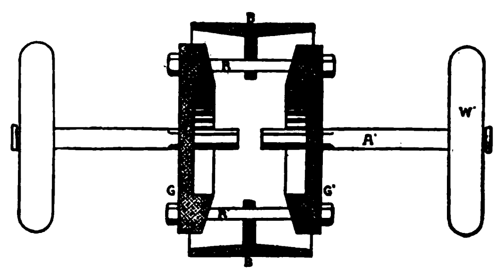

Figure 1.

Illustrating the Theory of the Differential Case. A, Live Axles; B, Differential Case; G, Side Gears; R, Levers to Illustrate Application of Power from Bevel Pinions; W, Wheels

The case may be driven by a bevel or worm gear in the form of a ring which clamps to it. This ring gear is driven by a bevel pinion or worm on the end of the propeller shaft which gets its power from the engine and gearset.

We shall now trace the power in detail through the rear end. It passes from the propeller shaft to the drive pinion (or worm), to the ring gear (bevel or worm gear), to the differential case, to the spider, to the bevel pinions, to the side gears, to the axles, to the wheels (hubs, spokes, felloes, rims) and to the tires. The wheels push the ground out from under them and the car moves forward or backward.

When the car turns a corner the inside wheel holds back on account of the resistance of the road. This slows down

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the axle and the side gear fastened to it. But the differential case continues to turn, carrying the spider and the pinions. Now if one side gear holds back the other must be driven that much faster. So the pinions begin to turn about the arms of the spider, increasing the speed of the other side gear and transmitting to the outside wheel whatever speed is lost by the inside one.

Indeed, this action is going on continuously as it is an extremely rare case for a car to travel exactly in a straight line. Any wavering from one side to the other will move the gears in proportion so that there is always a slight movement. This is not serious if the differential is properly lubricated. The real trouble comes when one rear tire is larger than the other as when we use one oversize tire or one is partly deflated or flat. Here the differential is working continuously, but fortunately such cases are rare in the entire life of a car.

The effect produced by the differential can be shown without taking it apart by jacking up both wheels and putting the gears in a speed. Turn one wheel one way and the other will turn the other. This is because the spider is kept from turning by the differential case. The pressure on the wheel is transmitted to the axle and side gear. This drives the pinions causing the other side gear to revolve in the opposite direction, and with it the axle and wheel.

Now, start the engine and put the gears in low. If the brakes do not drag and the bearings are free the two wheels will revolve at the same speed. Hold one wheel and the other will increase to double the speed. As one side gear is held stationary by its axle and wheel the pinions must revolve, delivering all the motion to the free wheel.

On account of its peculiar nature the differential sometimes gives us serious trouble. If one wheel is in a mud puddle or on other slippery ground it will revolve without driving the car. The fact that the other wheel has good traction does not matter because all the power goes to the free wheel as it has less resistance. The same effect is

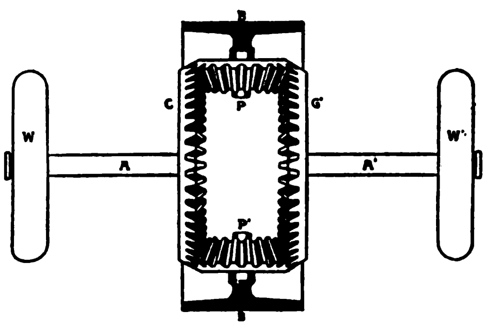

Figure 2.
Part of Differential Assembly. A, Live Shafts; B, Differential Case; C & G, Side Gears; P, Bevel Pinions; W, Wheels

produced when one wheel is jacked up and the engine run with the gears in mesh. The wheel in the air receives all the power, showing that it is impossible to drive off a jack.

When the car is stuck in a mud hole or deep sand it is useless to try to get out by spinning the wheel as it only sinks in deeper "digging its own grave," as we say. It is necessary to give traction to the wheel if the car is to get out by its own power. This may be done by wedging anything available under the wheel,—brush (small twigs and leaves), gunny-sacking, and even lap-robes may be used. A plank is best, if obtainable. Tire chains are excellent. When used for this purpose one end should be fastened to a spoke and the chain laid out flat on the ground. The power is let in gradually and the chain grips the ground and pushes the car forward. If a rope is available it may be wrapped around the tire.

Many efforts have been made to deliver power to each wheel, regardless of whether it is on slippery ground or

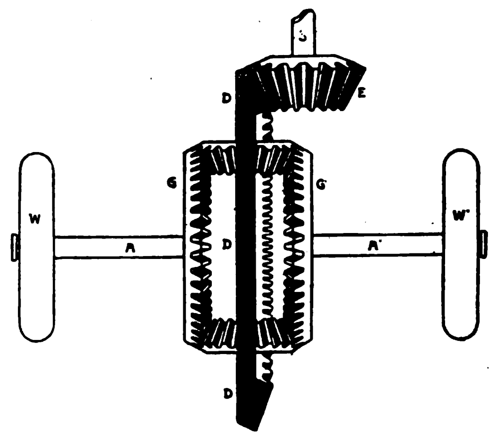

Figure 3
Same as Fig. 2 Except that the Driving Pinion, E and Ring Gear D, Are Shown

not. One method is to drive through ratchets or overrunning clutches. When making a turn the inside wheel does the driving and the outside one runs free. Other designs have been tried but none of them have come into general use.

Lublication of the differential is extremely important to prevent the absorption of power, to reduce wear and obviate the need for frequent adjustment. The advice of the manufacturer should always be followed as to the choice of a lubricant but the general principle is the same for all: use a lubricant fluid enough so that it will run at any temperature that is likely to be met. As the gears mesh they squeeze out the lubricant and it must run back of itself since there is no way of forcing it into place again.

A gear-case compound or steam engine oil (called 600W) may be used in the majority of cases. The most difficult place to lubricate is the inside of the pinions, as a thick lubricant cannot work in. Holes are sometimes drilled in the hubs of the pinions to assist in lubrication and none but an oil can pass through them. The manufacturers usually insist that nothing but a heavy oil should be used.

Substances, such as cork, fine sawdust, etc., are sometimes mixed with transmission oil to quiet noisy gears. It will be evident that such use in this case will be absolutely fatal. The manufacturers refuse to guarantee their product where any such substance is mixed with the lubricant.

As the differential wears it grows noisy. Naturally the most noise comes from the point where there is the most

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action; between the propeller shaft pinion and the drive gear of the differential. As the teeth wear the space becomes larger and a distinct hum is noticed. A slightly heavier lubricant may give temporary relief but there is then danger that some of the bearings will run dry. A serious effect due to this matter of wear is the loss of power which occurs.

When gears are properly meshed they transmit power from one to the other very nearly in a straight line, with very little side thrust. As they wear the space between them increases, giving more side thrust. This adds enormously to the friction and so cuts down the power. Then for two reasons the differential should be adjusted: one to restore as much of the lost power as possible and the other to reduce the noise.

Differential Adjustment

None but general directions can be given for this adjustment as the details differ with the different designs of rear ends. The idea is to move the whole differential over nearer to the drive pinion. But if it is moved too far it will bind and waste power, besides being noisy. The beginner's first few adjustments should be under the guidance of an expert until the method is learned. Be careful that the drive gear does not bind in one place and run free in another. In old cars this gear is apt to be sprung or worn out of true and if it is adjusted for the loose position it will be too tight for the other. The final test is to see that the differential makes a complete revolution without binding. This may be easily done by turning the propeller shaft by hand with the gears in neutral.

And do not neglect the locking device which prevents the adjustment from coming loose!

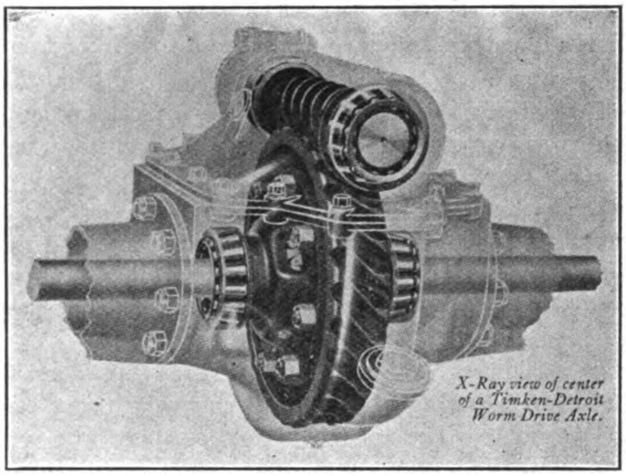
The worm drive does not become noisy as it wears, due to the fact that the gear is of bronze and also that the worm takes up its own wear to a certain extent. The differential may be moved from one side to the other and the worm may be adjusted front and back, but these adjustments require special skill and are best left alone by the novice.

A Locked Differential

In rare cases a tooth will break off of a side gear or pinion and wedge in between the teeth so as to lock the differential. The two wheels will now turn at the same speed, making it difficult to turn a sharp corner and giving excessive wear to the tire on the outside wheel. The metal may sometimes be dislodged by reversing the gears but it is not safe to drive with a broken tooth as there is danger of springing the differential and stripping the other gears. If it is impossible to free the differential, one may drive home with it locked but should go slowly and make wide turns around corners. But it would be better to have the car towed to the nearest repair shop for inspection. If it is possible to remove the axles without disturbing the wheels, as in the full floating type, this should be done before towing.

No mention has been made of the spur gear differential as the bevel gear type is the only one in general use at present. (A spur gear is one with straight teeth, such as are found in the transmission gear-set and machinery in general.) This type is only mentioned here for the information of the reader. It requires twice as many pinions as the bevel type and so is heavier and more complicated.

On the Ford rear end the differential is held in place



X-Ray view of center of a Timken-Detroit Worm Drive Axle.

by a set of washers on each side: two of steel and one of babbitt or bronze. As they wear they allow side play and noise. The only remedy is to remove the worn babbitt washers and replace them with thicker ones. A slight reduction of friction may be obtained by using ball thrust collars in place of the babbitt. These may be obtained specially designed for the Ford car.

At least twice a year the differential should be drained of all old oil and flushed with kerosene. Fill up to the usual level and jack up one wheel so that it just clears the ground. Start the engine and put the gears in low speed. As it is impossible to drive off a jack with the usual type of differential this is a safe procedure. As one wheel is stationary and the other free to revolve the differential is working to its full capacity. The pinions revolving draw the kerosene into the case so that every part is thoroughly flushed and cleaned of dirt. Let them run about ten minutes then stop the engine and drain out the differential. Fill again with kerosene and wash as before, repeating the process two or three times or until the kerosene runs out fairly clean.

If the housing is of the open type with a cover which can be removed for inspection and cleaning it will help matters if a paint brush is used around the inside of the housing to loosen grease and dirt. Use a round brush, what the painters call a sash tool. This will remove a great deal of dirt which would not otherwise be loosened by the kerosene. Having cleaned the mechanism to your satisfaction let it drain several minutes first with the gears revolving and later with them at rest, replace the plug, and fill up to the usual height with the proper lubricant for the season: heavy oil or gear-case compound according to the advice of the manufacturer.

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Three Fallacious Theories

The Beginner Should Not Be Too Ready To Accept as Facts Everything He Hears

By F. L. Allen

THE amateur automobile owner is often confronted with ideas given by those who, to him, seem to be well versed in things mechanical. Such ideas become so fixed in the mind of the amateur that he finally accepts them as facts, coming as they often do, from sources which he thinks are authoritative. Because the ideas *are* from such a source, he does not think to question them or to weigh them in his own mind but in many cases, if he did use his common sense he would find that they were fallacious.

The "compression" fallacy is perhaps the worst offender of the whole lot and the one which can cause untold trouble. The amateur is told by those who seemingly know the business that compression in an engine is everything. An engine without compression is worthless. This simple statement is absolutely true, but the novice enlarges upon it until he believes that the higher the compression, the better the engine will run.

In connection with this statement he is told that lack of compression is usually indicated by oil leakage into the firing chamber, (assuming that the trouble is in the pistons and rings), or conversely, by the leakage of fuel into the base of the engine.

Ordinary reasoning would seem to bear out the two latter statements. It seems obvious enough that, if the pistons and rings permit fuel to pass into the base of the engine or oil to work upward into the firing chamber, then something must be wrong in the fitting of the pistons and rings. The reasoning is fallacious and not always with a foundation, because the facts may be utterly opposite and such a leakage indicates excessive compression.

Let us assume that the compression is far above normal, so far that the excessive pumping is caused and carefully analyze the facts.

An Analysis

Upon the compression stroke of the piston the gas is compressed to a point where it assumes a semi-liquid state. Under excessive compression any gas tends to liquefy and therefore a certain amount of raw fuel is deposited on the piston head. This liquid will naturally run downward and under the high pressure will be forced past the piston rings. It may be said that the higher the compression, the greater the chance for fuel to work into the crank case, despite the rings.

With a low compression there is a chance for the suction of the intake to bring back most of the fuel. If the suction of the intake balances the compression, then there is very little chance for the fuel to leak downward past the rings, if the latter are properly fitted.

In the foregoing two paragraphs I have given some logic which would seem to be in direct opposition to a previous fact which I stated, that high compression may also cause pumping of oil into the explosion chamber from the base. I can hear you say that a cat can't jump two ways at the same time. That's true, but suppose that cat is twins! We are considering a four cycle engine with two sets of piston strokes, two upward and two downward to each cycle.

My argument for the forcing of fuel downward is based upon the fact that no rings can be made absolutely tight—there is always a slight leakage and the high compression will force more fuel downward than would a low compression. And under this argument we consider only the compression stroke and the force of the explosion which is many times that of the compression.

Upward and Downward Leakage Possible

The upward pumping action takes place on the suction or intake stroke. If there is a tendency for the cylinders to suck in gas from the carburetor, then that same tendency is exerted upon the leaks past the rings and oil is drawn upward. If the intake valves open late on the suction stroke, then the suction is increased and the pumping is more severe. And then, again, there is the peculiar valve action of the piston rings which tends to hold the oil once it has worked upward and behind them. Under these conditions it is possible for the oil to work upward and the fuel to work downward at the same time.

Every engine, is designed to carry a certain compression ratio and based upon this is the valve timing and so on. No attempt should be made, on the part of the misguided owner, to increase the compression above the figure recommended by the manufacturer, with the mistaken idea that he is helping the engine.

And this same suggestion is a good one for the repairman to note. Anything which will diminish the size of the explosion chamber will increase compression. A too thick piston head or the lengthening of the connecting rod through the babbitt bushing both tend to alter the compression ratio and may cause trouble.

Another fallacy which the amateur driver has accumulated is that regarding the management of the spark advance lever. Fortunately the manufacturers are gradually adopting the automatic advance devices, but such equipment is still in the "luxury" class and the cheaper cars are not so equipped. When driving such a car the driver must manage the spark advance properly or he cannot get maximum power from the engine. The slogan of "Advance the spark as far as possible without

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causing the engine to knock" has become distorted until it is accepted by the novice in the form of, "When the engine knocks, retard the spark."

Like the first fallacy mentioned, the statement is entirely correct as far as it goes; the man who does not retard the spark when the engine knocks is either deaf or careless. But if he waits for the engine to knock, before he retards the spark, on a grade, he is damaging his engine, losing power and stands but a small chance of making the grade without changing the gears.

A spark knock is an indication that a part of the explosive force is being exerted to drive the piston backward on the compression stroke. A spark advanced too far is one extreme whereas a retarded spark is the other, but of the two evils the latter is the lesser one since it cannot damage the engine, though it may overheat it.

Retard Spark Before Engine Knocks

Train your car to note any diminution of engine speed, then learn how slowly the engine will run, without knocking, and under a load, in various spark lever positions. With this knowledge you will be able to retard the spark *before* the engine knocks. And when you can keep the spark position just below that point where the engine tends to knock, then only can you expect efficiency. Correct manipulation of the spark lever under these conditions will carry you over hills which you could never negotiate were you to wait for the knock of the engine to retard the spark.

Another fallacy which seems general is that regarding the use of heavy and light lubricating oils in the engine. The owner finds that his engine is carbonizing faster than it should, or faster than it did when he first purchased the machine. He assumes that the cylinders have become worn to such an extent that the lubricant leaks past the rings and causes the trouble. His would-be friends advise him to use a heavier grade of oil and he does so but the carbon trouble seems to increase. He jumps to the conclusion that a still heavier oil is needed and is not discouraged until some bright day the bearings burn out and the engine needs a full overhauling.

The Heavy Oil Fallacy

Heavy oil is not always a cure for carbonization, on the contrary it contains more carbon, that's one reason why it is heavier. Heavy oil tends to gum the rings and aggravate the troubles which the owner is seeking to cure. If the oil is too heavy for the lubricating system it eventually fills up the oil channels and grooves and the parts do not receive lubricant. It may be said that such a remedy is worse than the disease.

Oil, heavy or light, cannot be used to replace the metal worn away from the rings or cylinders through friction. If, upon trial, a slightly heavier oil, than usual, does not reduce carbonization then the owner should not continue along that line of reasoning and use still heavier oil; on the contrary he should remedy the trouble at its source and repair the rings or the cylinders.

ADJUSTING THE FOURTH BEARING ON THE FORD MOTOR

By Glen F. Stillwell

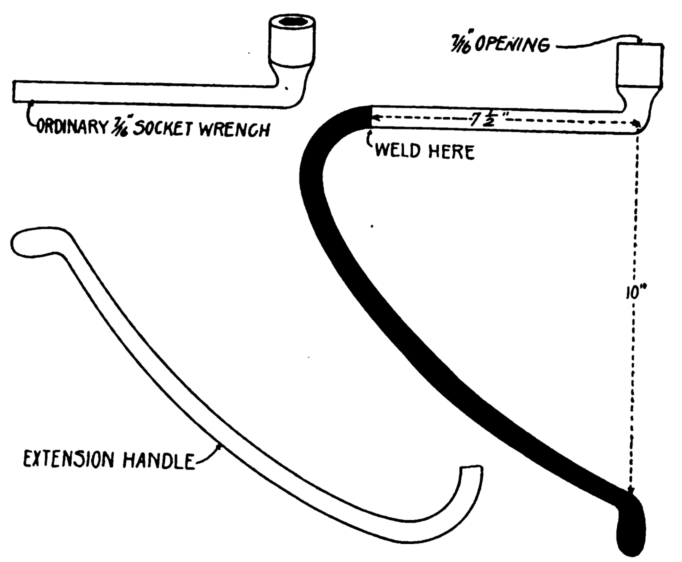
THE output of the Ford Motor Co., being something like four thousand motor cars a day, we are safe in saying that at least three or four of the readers are Ford owners, and incidently there are fourth bearings to be tightened.

Bearings, on the motors that are properly taken care of, are adjusted periodically whether they need it or not. Oftentimes the owner is not, for some reason or other, in the position to have the bearings tightened when they need it, consequently they are neglected. And this fourth connecting rod bearing has been the dread of every novice, and of a good many expert mechanics. In fact a few so called mechanics when adjusting the rods, neglect this one entirely, placing the blame of the resulting knock, on the rear main bearing, or the generally mythical, cam knock.

There are a number of misguided tinkers, who get after the bearing with a hammer, and chisel, and after adjusting, key the nuts with a 1/32 size cotter, or else leave the keys out entirely. This is their loss, and a *good* mechanic's gain.

With a good wrench, and a little patience it is no trick, even to the amateur, to tighten this rod *properly*, without removing the motor.

Remove the radius rod, drain the oil, unscrew the



A Handy Wrench to be Used for the fourth Connecting Rod on the Ford

fourteen caps screws that hold the bottom plate in place, and remove same.

This done, get number one rod in a position to adjust, i. e., at the finish of its downward stroke. Remove lower cap, after having made sure that it is marked on the cam shaft side of the motor, with file, or punch mark. This cap must be filed carefully, and evenly, and then replaced with the marks corresponding. Remember, you can always file away material, but you can't put it back again, so go easy. Generally all bearings (connecting rod) wear alike, therefore if ten strokes of

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the file will make a snug fit on number one, the same will apply on number two, three, and four.

Thus it follows that you should tighten the first three at the start, and you will know just about where you stand when you get after number four. You are justified in tightening this last named a trifle stiffer than the rest, for in this way you will be able to test the fit by cranking the motor, otherwise you would have no way of telling whether it was tight or not. The other rods can be tested by tapping the bearing from side to side with a small hammer. You should just be able to move the natural end play in the bearing, with a light blow from this tool. After you have adjusted one bearing, loosen it, and proceed to the next one, and so on.

To tighten number four get the rod in a position, an inch or so from top dead center, on its downward stroke. This puts it on the side of the motor, opposite the valves, and fairly accessible to the workmen. Accompanying this article will be found the design of a fourth bearing wrench, the idea of an ingenious friend of mine. I have used a number of the fourth bearing wrenches that are on the market, including the ratchet type, but in my estimation this home made article is unrivaled. A great many of the tools designed for this purpose, appear to be devised by persons who have been no closer to the fourth bearing, than the Ford Manual. One great fault is that they make the jaws of the tool too heavy. Another is the freakish bends they make in the handle. It makes them about as useful for this purpose as an 18-inch pipe wrench.

The bend in this home made tool allows you to put pressure directly beneath the fourth bearing nuts thereby facilitating their removal.

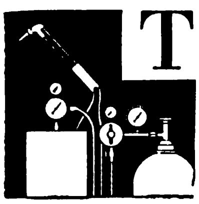
And last but not least, friend reader, do not forget, after tightening the nuts, to lock them in place with the proper size of cotter pins, which is 3/32 by ¾. Put a full key in, even if it requires an extra hour of your time, and patience. If you do not do this you may regret it, as many others have done.

Another thing, if your bearings have been neglected a long time, and are knocking badly, it is best to replace them with rebabbitted rods that you can obtain at a service station for one dollar. This process of refitting an old, and beaten up bearing is unwise, and not worth your time.

Working Sheet Metal

Tools That Are Used and Are Necessary in Bending, Cutting and Forming Sheet Metal

By J. F. Springer



THE repair shop which has principally to do with metal will ordinarily have more or less work in which the metal is in *sheet form.* Where the jobs are infrequent and the work is of an intricate nature, the logical thing will usually be to send it out to a sheet metal shop. But there is a good deal of work not so elaborate that might be done right in the shop, if only the proper tools were available.

I do not wish to belittle the trade of working up sheet metal. It is a trade, just as carpentry is a trade. At the same time, there are any number of jobs that can be done by almost any intelligent and resourceful workman, provided he has the necessary tools. This is the case also in carpentry and any number of trades.

Hand Tools

The *scratch awl* is used for sheet metal when one is laying off work, just as it is with heavier material; and therefore is too well known to need any especial attention.

Bench stakes are a class of anvils. They serve to give form and guidance when sheet metal is bent over them. They fit into suitable holes previously made in the work bench. That is, the wooden top of the bench has, secured in place on it, a metal plate in which the proper stake holes have been formed. The use of this plate is perhaps not a necessity. It serves to relieve the wooden bench top from excessive wear and tear.

There is another form of bench plate. This is a special appliance suited to the case of the shop where only a few holes are needed. It will have a size of, say, 8½ by 8½ inches. Underneath, the plate has a circular form. This part rests in a circular depression made in the bench top. There is a vertical rod which projects downward from it. This passes through the bench top. There is a suitable clamp which may be brought up against the under face of the bench top. This clamp is a kind of flattened V. Through the center the vertical rod passes. The lower end of this rod is threaded and thus provides for a nut with a handle or lever. The nut may be adjusted by turning in order to force the clamp against the bench top or to loosen it from the bench top.

In short, the device is adapted to be set in position and then quickly made secure; and also to be released promptly when desired. The whole plate may be turned to any one of four positions and thus bring the various stake holes to convenient positions in front of the workman. This is a very handy device. There are other forms of detachable stake plate, especially where special anvils are to be used.

Thus, there is a detachable stake holder, consisting in part of an upright. It is secured temporarily to the bench top by similar means to those just described. At the top

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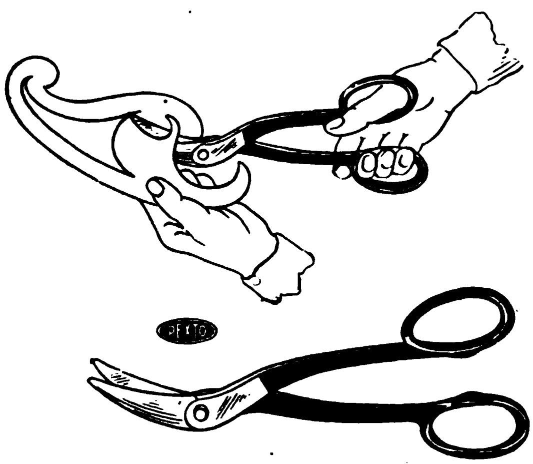
of the upright, the apparatus consists of a kind of clamp or vise adapted to clamp down on a horizontal rod-like stake and hold it in horizontal position. Such a holder with 8 or 10 anvils or stakes of the kind mentioned constitutes a cheap piece of equipment capable of affording the means of doing a very considerable variety of work.

Cutting Sheet Metal

Naturally, some means of cutting sheet metal should form part of the shop's equipment.

The design of what is perhaps the most convenient and usable form of hand shears is now over 100 years old. The *hand snip,* as the ordinary form of hand shears is



A Combination Scroll and Circular Tin Snip for Ornamental Work

called, comes in a number of varieties. There is a combination style suited for straight cutting and also for cutting curves and the like.

One may secure a hand-operated shears of such design that it may at once be set up on or taken down from the bench. A hand snip of the combination type together with this bench shears will perhaps suffice for a small shop. A larger repair shop may add a foot-operated shears, if desired. These come in considerable variety.

Raising Appliances

Sometimes, metal work requires that flat plates be beaten into curved forms, where the surface is, say, convex-spherical on one side, and concave-spherical on the other. *Raising hammers* and *raising blocks* are the chief things. The head of the hammer may be given a rounded form so as to make it suitable for hammering on the hollow, or concave, side of the work. The raising block may be of hard wood or else of lead. A wooden block may be home-made, as one has only to get a 3-foot section of a hard-wood tree trunk that has a diameter of 12 inches or more when peeled.

The sides are squared, and one of them is provided with spherical hollows made on several different radii of curvature. These are to be shallow and smooth. When the block is set up so as to be solidly in position, it is ready for business. Lead blocks are used for small forms. Such a block may be eight by twelve inches in horizontal dimensions and four inches high. The depressions may be made simply by using the round face of the raising hammer. A round-headed stake may be used as a finishing device. It is employed along with a wooden mallet to remove dents and similar irregularities in work that has been raised by the raising hammer on the raising block.

Hammers

The process of closing the joint where one edge is bent over another is called *peening.* A special hammer, known as the *peening hammer* or *setting hammer,* has a double taper on one end of the head. The edge is narrow and so shaped as to fit it for closing the joint.

The *riveting hammer,* as its name implies, is used for riveting. There is a taper on one end of the head, but this taper is single, not double, and has moreover a rounded edge. It differs, then, from the peening hammer and is not a substitute for it.

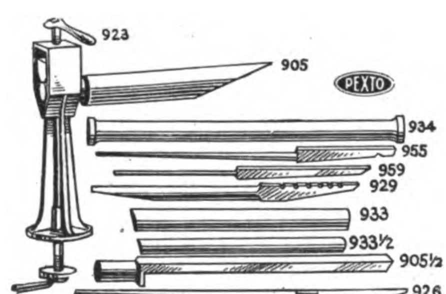
The *mallet* when made of wood, usually has a head of hickory. This mallet may be bought ready-made or it may be made in the shop.

Punches

The *hollow circular punch.* These naturally have a circular cutting edge. They may be bought in sizes ranging from, say, one-quarter inch to three and one-half inches. They may also be made in the shop. Thus, bore a solid round bar of tool steel at one end. The hole may be quite shallow, say, ¾ inch deep. The edge is then forged. The piece is now permitted to cool off to a black.

Afterwards, the steel is re-heated to a *bright red* (a little higher than medium cherry red), the heating being so managed that this color extends up the bar for an inch or so. The whole is then allowed to cool slowly until the work is back again to a black color. It is now heated up again, but this time so as to involve only about one-half inch of the end. The color is to be the bright red. It is now dipped in oil or water. The oil should, naturally be of a grade which will not catch fire when hot work is dipped into it.

If a bath is prepared with a one-half inch layer of oil



Stake Holder and Various Shapes of Stakes Used in Shaping Sheet Metal Work

on top, the hardening and tempering may both be done at one and the same time. Or, the tempering may be done separately.

If so, draw the temper to a *light yellow.* The punch may be made from stock of a smaller diameter. The first thing to do, then, after cutting off the piece, is to *upset* one end. Or, this upsetting may perhaps be done more conveniently, if it is carried out prior to cutting off.

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Thus, the one end of a considerable length of bar is heated up and the bar allowed to fall vertically on the anvil and in the direction of its length several times. This fall will cause the end to bulge and swell. Or, one may simply use a hammer on the soft end.

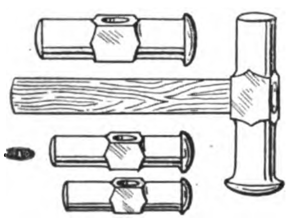
In the foregoing, the first cooling to a black and the following re-heating were for the purpose of restoring the quality of the metal to a reasonable extent, and these operations should not be neglected.

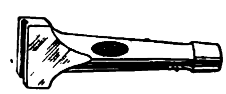
Miscellaneous Tools

The *rivet set* is a short bar of steel on one end of which are slight hollows of a spherical or nearly spherical shape. These have various sizes, and are intended to form the heads of rivets. Then, there is the *hand groover,* a tool having a face suited to grooving along a seam after the folded edges have been made to interlock. A *combination pliers and wire cutter* will be found a useful tool.

Soldering Tools

If the work is to have the joints soldered, the necessary tools for this operation should, of course, be available. A small, single-burner gas furnace may be used for heating the soldering "irons." Or, a fire-pot using solid fuel may be substituted. By adjusting the inlet for atmospheric air,





Above, A Hand Groover. At Left, Forms of Raising Hammers

this apparatus may be made to produce an exceedingly hot flame. Natural or city gas may be used. The soldering "irons," or rather, soldering coppers are obtainable in various sizes and forms.

Using Sheet Metal Equipment

A very usual job, when working with sheet metal, whether it be iron, steel, copper, brass or what-not, is *making a joint.* It will be to the point then to consider this and learn just how the work is to be done.

The first thing to do is to fold over the two edges. The folds are made by simply bending back the edges. The one fold will lie up, the other down. The one may then be readily hooked into the other. In this way is formed a very popular style of joint. The folds may most easily be made on a special machine, but they may also be formed with hand tools. After the one fold has been hooked into the other, the wooden mallet may be used to flatten the folds. This type of seam is proper when laying tin or copper roofing that is to have a flat joint. The seam is a strong one and may readily be soldered and thus made water-tight. This is the simple *folded seam.*

The joint may be made, however, if the metal is light, by using the *grooved seam.* This is the correct thing for the light-weight material. The edges are prepared as before—that is, each is given a simple fold. When these have been hooked together, the hand groover already mentioned is employed. The stake known as the hollow mandrel stake or the solid mandrel stake is used as an anvil. The result desired is to run a groove along the rounded turn of the under fold. This rounded turn (or edge) is out of sight, but it is there just the same. The idea is to groove down the upper metal and make it fit snugly against the side of the seam. One may readily see that the seam consists really of four thicknesses of metal. The region of four thicknesses is really the seam. It is desired in grooving to have the two sheets on a level with each other and to leave the seam as a ridge. The grooving effects this result.

With ordinary flat work that may be turned over, one may readily put the ridge on the under or inner face. The appearance outside will be improved. If this countersunk grooved seam is wanted in the case where the work cannot be turned over, it may be formed in the following way. A flat rod of a not too soft a metal is provided with a groove or shallow depression, which is made along its surface of the exact size to receive the ridge made when the seam is given final form. The hand groover is now put aside and the mallet used to force the folds down into the groove. The groove gives shape and does the side grooving, only now the side groove is underneath.

In grooving, the seam is to be dealt with first at one end for a couple of inches or so and then similarly at the other end. The grooving may be then completed by working along the intervening part of the joint. The groover is to be handled in such a way so as not to mar or cut the metal anywhere.

The final operation is a flattening with the wooden mallet. That is the grooved seam is flattened along its length.

There is an ordinary overlapping of unfolded edges which is sometimes used to form a *lap seam* where the joint is to be finished by soldering or gas-welding.

The Operation of Raising

Where it is desired to give flat metal a bulge, as when forming a convex or rounded cover plate or similar form, one uses the raising hammer and the raising block. Suppose we have a circular disc which we have just snipped out of a flat plate and to which we now desire to give a spherical bulge or convexity. We beat the metal against the proper depression in the raising block. There is a right way to begin and a wrong way. We are always to start at the outer edge, beating in a circuit round the disc. As the blows go round and round, we manage things so that the hammer makes a closer and closer approach to the center.

In fact, one follows a kind of spiral path, beginning at the outside and working more or less gradually towards the center. The hammering is not carried round and round the block. Instead, the disc, held in one hand, is manipulated to get the same effect. That is, the disc is turned as we beat with the hammer. One is to exercise care in raising the center as it seems easy to get the

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idea that hard beating is necessary. If the center is beaten too hard, the center will probably bulge excessively.

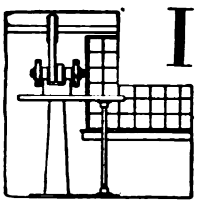
Acknowledgments are here tendered to Mr. L. Broemel for a large part of the story I have been telling. Those who wish to go further, will do well to get a copy of his *Sheet Metal Workers' Manual*, an up-to-date work on this topic.

We are indebted to the Peck, Stow & Wilcox Company of Southington, Conn., for the illustrations accompanying this article.

Aligning Rear Axle Housings

A Repair Job Which Is Difficult Yet Which Is Often Necessary

By David Baxter



IF all automobile repair work the straightening of warped rear axle housings is probably the worst. It is one class of repairing that many garage mechanics evade whenever possible. In fact it is one job where everything is against them and it is scarcely possible to secure perfectly accurate alignment no matter how it is done. The mechanics who attempt this work are lucky if they can closely approximate the original alignment. There are few special tools for the work and few instruments for measuring the distortion.

However, the garage that has an oxy-acetylene welding plant in its equipment is probably better fitted than those that depend upon a forge, since the heat of the welding flame is more readily concentrated just where it is needed, and with little danger of overheating. Just enough of the housing may be heated to take the "kink" out of it. That is, only the high spot of the bend is heated which is the part where the distortion bends both ways.

Method Applies to All Types

Of course there are several styles of rear axle housing but the theory as here described is practically the same for all. In other words the straightening can be accomplished under the same principle with a few changes in the way it is applied.

Therefore a discussion of one particular housing job should furnish the basis upon which the mechanic can work to devise other ways of straightening other kinds of housings. If he can grasp the main idea he should be able to fit the job to his own shop equipment.

Consider a housing like the one shown in the accompanying photographs. If it comes to the shop already removed from the car the first thing to do is to dismantle the brake rigging. Remove all movable parts to make the handling easier; a housing of this sort is quite heavy and is a bunglesome thing to handle even when the loose parts are stripped. Of course if the car comes to the shop with the housing in place the first thing to do is to remove it from the car. Then strip it.

The next step is to locate the kink; or kinks, but usually there is only one. In the instance under consideration this was done with a surface gauge such as is used by machinists in connection with lathe work.

But first two stubs were turned out on the lathe; one to fit snugly in each end of the housing. These stubs were merely two pieces of shafting with three or four inches of one end turned down to fit the opening in the ends of the housing. These turned ends were made to fit the housing tightly without danger of swelling it. Several inches back from the machined ends of the stubs, two or three inches of the shafting were cut down to the size of the machined ends. That is, another portion of the stub was trued up to the turned ends. The details of the stubs are shown in a sketch accompanying this article.

Rod for Driving Out the Shafts

Before driving these stubs into the ends of the housing a short iron rod was placed inside of it. This was for the purpose of backing the stubs out after straightening the housing. In other words the rod was to be jerked back and forth to drive the stubs out. This rod was half an inch or so smaller than the inside of the housing and was about a foot shorter than the distance between stubs, which afforded plenty of play for driving them out. Both photos show the rod in place.

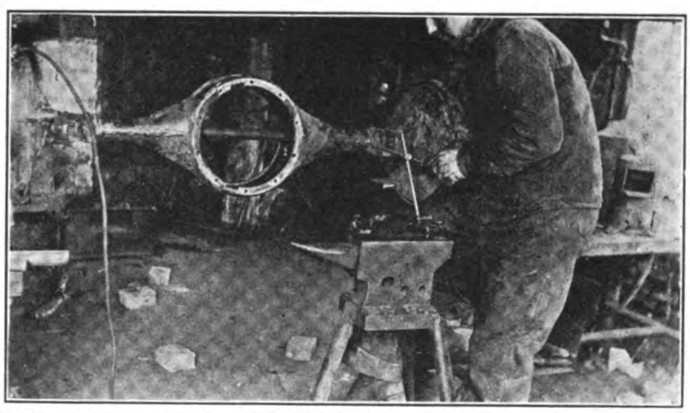


Fig. 1. Locating the Bend with a Surface Gauge

After fitting the stubs the job was arranged upon two V-blocks as shown. The machined part of each stub rested in a V-block so both would turn true. The V-blocks were arranged on tables at opposite ends of the

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housing. This permitted the whole thing to turn freely in the V-blocks, ready to be tested to locate the kinks.

This process hinges on the fact that the housing could not bend in the casting at either end on account of the brace ribs. In other words, the bend must occur between the ends of the castings where they join the steel portions of the housing. This is as close as the location can be approximated by eye. Therefore the mechanic must devise some method to find the high side of the bends.

In this particular instance a surface gauge was placed as shown in Fig. 1, the point of the indicator barely grazing the housing. Then the housing was slowly revolved several times so that the highest spot would push the indicator back. The housing was then revolved again several times to be sure there was no mistake. The spot where the indicator touched the housing was therefore the high side of the bend. Directly opposite this the indicator was the farthest from the housing, or the low side A chalk mark was then made on the exact center of the high side.

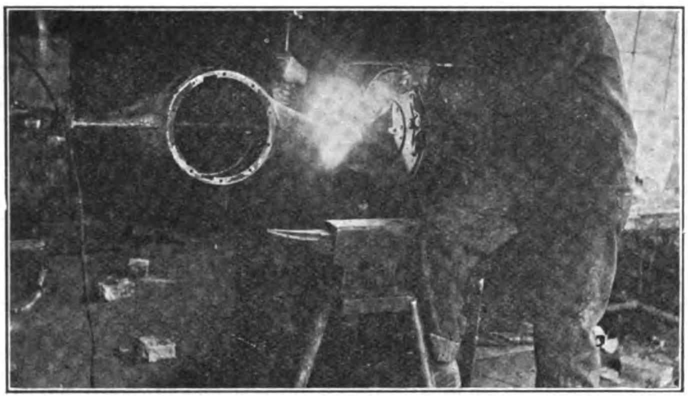

Fig. 2. Heating the Bent Portion with an Oxy-Acetylene Flame

Then without disturbing the V-blocks the surface gauge was moved to the other end of the housing. Here the revolving and testing process was repeated with the surface gauge. Another chalk mark was made along the high part of this bend. This mark was found to be on the same side of the housing and directly in line with the first mark; indicating that the housing was bent in two places; one at each end where the tube joined the brake castings. There was no evidence of a bend in the middle of the housing, which would show quite plainly in twisted metal or cracks.

After both ends were tested a center punch mark was made in each chalk mark to prevent error in case the chalk was obliterated. This was also to cause the location of the bend to stand out clear when the housing was heated. The center punch would show plainly when the metal was bright red, while a chalk mark would not show at all. This is a good idea to remember when straightening or cutting other metal parts aside from axle housings.

Next the mechanic selected a large size welding tip and fitted it to a heavy duty welding torch. This was highly essential because a small flame would not supply enough heat to keep the bent axle sufficiently heated for straightening purposes. The bend must be red hot all the way round the housing to make the straightening accurate. This condition must be practically the same all the way round the bend. That is if there are bright red portions joining dull portions the dull portions will not bend the same as the hotter portions.

A small flame will not keep one part hot and heat another part at the same time because the heat is conducted away too rapidly by the cold metal on each side of the heated spot. A welding flame supplies an intense heat but not a large amount. Therefore a large flame must be employed to heat a large area, everything being in proportion.

In this case the flame was adjusted to the neutral condition since this is the hottest flame obtainable without endangering the metal to oxidizing. In other words the flame to use in straightening bent axles is the same as for welding; it carried equal parts of oxygen and acetylene. Had either been in excess the flame would not have been neutral and would have lost part of its heating quality. A flame carrying an excess of acetylene would not furnish heat enough, and an excess of oxygen would endanger the steel of the housing to burning. That is an excess oxygen flame will burn a hole through the side of the housing almost before the operator can realize it, due to its powerful oxidizing effect.

Therefore a large neutral flame was applied to one bent portion of the housing. It was played back and forth over about six inches of the tube. As the metal turned red the housing was revolved in the V-blocks. As fast as this occurred the flame was applied until a strip about six inches wide was heated entirely around the housing. To accomplish this the operator was forced to employ considerable deftness in order to get the whole surface the same color of heat.

The housing was turned back and forth and the flame shifted from one portion to another according to the condition of the heat. At first the heat died out rapidly as soon as the flame passed on, but after awhile the whole section became bright red. Conduction caused the delay.

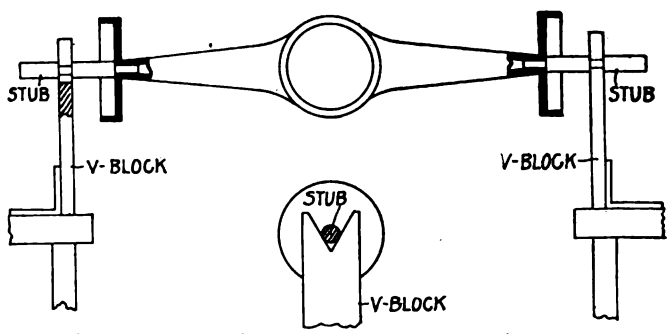

Fig. 3. Drawing To Show Method of Testing for Bends

During this heating process a helper stood ready to press and hammer the crooked housing back to shape. By throwing his weight upon the ring in the middle of the housing and striking the high side of the heated bend he was able to force the housing back in close alignment. After a vigorous attack the surface gauge was once more brought in position; as quickly as possible to prevent the loss of heat. Then the housing was revolved until the amount of straightening was determined.

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As the housing was not sufficiently straight the heating process was repeated and once more the helper attacked the kink. Then again the housing was tested with the gauge. Thus the bend was finally removed a little at a time by repeated heatings and hammerings, the worker being very careful toward the last to see that the housing was not bent in the opposite direction. He also made sure that the high part of the bend was upward when the pressing was accomplished. That is, the center punch mark was upward and the pressure and hammering downward. This was essential to prevent side bends and to eliminate danger of enlarging the original bend.

The helper had to be careful about the way he hammered the housing as it was comparatively thin and fragile. The blows had to be flat and squarely landed to prevent battering and tubing. And there was danger of flattening the tube if struck very hard when the metal was bright hot; merely flattening the tube instead of straightening the kink. The downward pressure on the center ring did more toward removing the bend than the hammering, especially at the start when the kink was the largest. The sledging was more in the nature of jarring to cause the metal to relax. The operator placed the torch aside to hold the housing rigid during the hammering.

When at last the bend was as nearly eliminated as possible, the torch was again lighted and applied to the other bend at the opposite end of the housing. The same neutral flame was used, and applied in a like manner. By a succession of heatings and hammerings this kink was pressed out. By the time this end of the housing was ready to treat, the heat in the first bend had died out until there was no danger of re-bending it.

After the second bend was as near in alignment as was possible to get it without special tools, the surface gauge was applied to both ends in turn to make sure no mistake had been made. This final testing was done after the bends had cooled almost to normal so that contraction might not show up after the job was delivered. The housing was then placed upon the floor and the machined stubs removed by jerking the short piece of shafting back and forth as stated above.

Now this method is probably crude for shops that are more completely equipped, but it is helpful for shops that have no special machines for this class of work. Shops that have a tire press or other pressure machines can straighten such bent housings without heating if they are blocked up rightly and the pressure is applied slowly. It is no doubt better to heat the bends before applying the machine pressure, that is, to have the bends red hot when the pressure is applied. This eliminates all danger of breaking the housings, but they must be watched to keep them from slipping sidewise.

AUTO RULE NO. 1

Newlyrich: "I'm getting an automobile. What is the first thing one ought to learn about running it?"

Wiseacre: "The telephone number of the nearest repair shop."—*Boston Transcript.*

HOW TO MAKE PIPE BUSHINGS OUT OF STANDARD PIPE

By W. F. Schaphorst

IT IS a good thing to know that bushings can be made out of standard pipe. Many pipe fitters don't know that it can be done. Or, if they know that it can be done they don't know the correct size of drill to use for tapping. I have always known that it can be done and have occasionally made bushings out of pipe, but each time I found it necessary to look first into my handbook for the drill size to use and that is so much trouble that it is frequently easier to go to the store and buy a new bushing.

Recently, though, it has been very difficult to buy bushings in stores on account of shortage of all pipe fittings, hence I feel that the following information should be of much value. I have collected all of the data together for all bushings that can be made out of ordinary sizes of extra heavy and double extra heavy piping.

To bush from ¼ inch to ⅛ inch, for example, get a piece of ¼ inch extra heavy pipe sufficiently long for cutting the outside thread. Then cut the end off to the desired length, drill or ream with a 21/64 inch drill (diameter of drill 0.328 inch) and then tap with a 1/8 inch pipe tap. That's all there is to it.

The table enclosed tells the complete story for all ordinary sizes: Note that in one case, 3/8 inch to ¼ inch, the internal diameter of ⅜ inch, extra heavy pipe is such that no drilling is necessary.

Also note that in bushing from ½ inch to ⅜ inch either extra heavy or double extra heavy piping can be used.

To Bush From	Use This Size of Pipe	Use This Size drill or reamer
¼" to ⅛"	¼" Extra Heavy	21/64" Drill = 0.328"
⅜" to ¼"	⅜" " "	None
½" to ⅛"	½" Double Extra Heavy	21/64" Drill = 0.328"
½" to ¼"	½" " " "	27/64" Drill = 0.422"
½" to ⅜"	½" " " "	9/16" Drill = 0.562"
½" to ⅜"	½" Extra Heavy	9/16" Drill = 0.562"
¾" to ⅜"	¾" Double Extra Heavy	9/16" Drill = 0.562"
¾" to ½"	¾" " " "	11/16" Drill = 0.688"
1" to ¾"	1" " " "	29/32" Drill = 0.907"
1¼" to 1"	1¼" " " "	1⅛" Drill = 1.125"
1½" to 1"	1½" " " "	1⅛" Drill = 1.125"
1½" to 1¼"	1½" " " "	1-15/32" Drill = 1.468"
2" to 1½"	2" " " "	1-23/32" Drill = 1.72"
2½" to 2"	2½" " " "	2-3/16" Drill = 2.187"
3" to 2½"	3" " " "	2-9/16" Drill = 2.562"
3½" to 3"	3½" " " "	3-3/16" Drill = 3.187"
4" to 3½"	4" " " "	3-11/16" Drill = 3.688"
4½" to 4"	4½" " " "	4-3/16" Drill = 4.187"

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Automobile Dealer and Repairer

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

Buying the Used Car

THE bottom has not dropped out of the used car market simply because automobiles have been in such demand that there is always a buyer for every machine. But the prices on used cars are extraordinarily low. With a new Ford car selling at a little over four hundred dollars, including war tax, it is natural to assume that one several years old will have depreciated at least 60%, and therefore the used machine will market at a price 60% below the new one of today.

Practically every other car on the market, in the medium and low priced class, has suffered as similar fall and the decline in the valuation of the used car has been rapid and great.

An analysis of reasons for these low prices is hardly necessary, but is worth reviewing. First, we have the drop in new car prices; second, we have the general business depression which has forced many to sell their cars; third, we have the situation in which many have found that they couldn't afford cars in the first place and finally the season.

It would seem that every circumstance has combined to bring the prices on used cars down to the lowest point. In previous years we have had a downward trend of used car prices but in every case this drop has been caused by but one or two of the above reasons. The seasonal drop which comes during August and September of every year is usually a big one because dealers are afraid to carry their stocks over for another year.

But in view of existing conditions it does not seem possible that lower prices on used cars will be had. And so we advise our friends, who intend to buy a used car, to buy it now. Even though the purchase of a car may mean the payment of storage charges on it during this winter, the price is so extremely low that such a payment will be an excellent investment.

It is fairly safe to assume that the lowest ebb of our business depression is passed. Those who could not afford cars have already disposed of their machines. Manufacturers have cut the prices on new cars until it seems impossible for them to pare off another dollar. Logically, then we cannot expect much better in the way of bargains than at present.

The too-shrewd buyer who waits for Spring stands a big chance of paying more for his car than now. Even though every circumstance tends to push down the prices still further, there will be the seasonal, Spring demand for cars which will more than counteract such a downward tendency.

And the answer to all of this is obvious; buy your used car during the months of October and November.

A Thriving Business

IN THE city of New York during the first eight months of this year there have been 2,966 motor cars stolen. Last year's figure was 3,530. From this it is plain to see that last year's score is to be exceeded unless something drastic is done. Motor thieves are plying a thriving business in this city and the police seem to be helpless.

Although the police are blamable, in a measure, they cannot be held responsible for but a small percentage. The motor car thief is not a sneaking thug, but usually a well dressed, smart appearing man who steps into the car as though he owned it and drives away. Do you expect the police to question every person who does this? Naturally not. Then there is but one remedy and that to lock your car, just as you lock your garage or your house, when you leave it. The thief seldom steals a locked car. Unless you do this you alone are to blame if your car is stolen.

Annual Tool and Machinery Number

THE October issue of this magazine is to be our Annual Tool and Machinery Number. It has become an institution with us because we find that it has been of great interest to our readers in all classes. The Tool and Machinery Number has proved itself to be as necessary as the regular Automobile Show numbers.

The car owner may not be interested in heavy garage machinery, but nevertheless he must realize that when tools are mentioned the term covers all kinds of devices for making car repairs. Therefore, it follows that his interest in this number will be covered by many of the articles in it.

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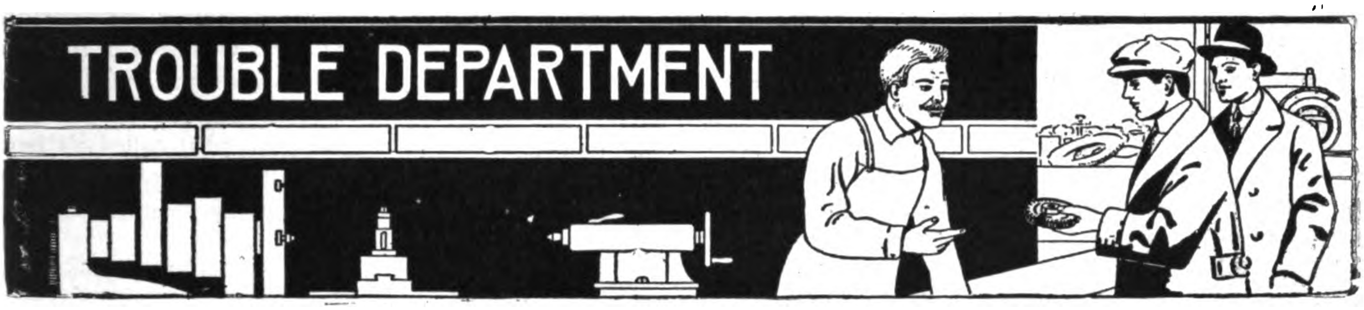

Ammeter on Chandler 1917 Car

3016

From C. E. Lenox, New York:—I have a Chandler Six, 1917 car. This machine is equipped with a Gray & Davis system but no ammeter. Can you tell me where to install the ammeter?

Reply:—We will give you a rule which works out in a large majority of cases, when installing ammeters on the older makes of cars. The rule is true in most cases where the starting switch is not grounded, or that is to say when the ground is not necessary for the operation of the starting switch.

Trace the wire which leads from the battery to the starting switch and if you find that this wire is tapped with a smaller one leading to the dash-board, or if such a small wire is carried off from this wire either at the battery or at the starting switch, then an ammeter may be installed at any point in the smaller wire.

In your case you will find that such a small wire leads from the starting switch to a junction or connection box and thence to the fuse box on the dash. The ammeter may be placed at any point along this line.

Jerky Action in Maxwell

3017

From U. G. Wile, West Virginia:—I have a 1921 Maxwell which is giving me some trouble at low speeds. There seems to be considerable back lash between the engine and the wheels and at low speeds the car operates with a jerky motion. At times the engine seems to lag against the wheels and vice versa. Will you kindly inform me how to eliminate this trouble?

Reply:—In many cases we have found that the driver blames the "jerky" action of his car to the mechanism rather than to the engine but before doing this he should make sure that the engine is working properly. No engine will give as much power or torque at low speed as it does at normal, if it did there would be no reason for a gear shift. Possibly, in your case, the trouble is in the engine, not in the transmission system.

Before bothering with the transmission we would advise you to make a careful test of the engine, see that the gasoline adjustment is correct for low speeds. Find out if the trouble is obviated by a richer mixture, or if there is no needle valve adjustment, cut off some of the air at low speeds. Also see that the ignition system is in order.

If you find that the trouble is not in the engine, then you can test out the transmission system. Jack one wheel from the ground and throw in the reverse gear. (Be sure that the ignition is off.) You will find that the engine will lock upon the propeller shaft and by moving the free wheel back and forth you can locate any lost motion in the differential.

While you are working the wheel watch the propellor shaft to see that it does not turn. Naturally you must expect a certain amount of lost motion in the rear axle, but the wheel should not turn more than three inches, measured on its circumference, without coming up against the compression of the engine. The three inch play will then represent the total lost motion between the engine and the wheels.

By letting the wheel down on to the ground again and by twisting the propellor shaft backward and forward you can locate the lost motion in that member, or rather between it and the engine itself. The total motion lost between the wheel and the engine should not be more than that stated in our last paragraph.

Lost motion in the rear axle may be caused by worn keys or seats in the wheels; loose gears on the ends of the shaft; play in the differential spider; worn gears; improperly adjusted driving gears or a loose master gear.

Lost motion between the axle and the engine might be caused by worn gears in the gear set; play in the universal joints; or loose clutch members. Only a careful examination can reveal the trouble.

Alcohol and Gasoline Mixtures

3018

From R. E. Heinisch, New Jersey:—Will you please advise me as to the use of mixtures of alcohol and gasoline in a gasoline engine? Do you think that more power would be produced by the use of alcohol with gasoline or in the shape of vapor fed into the intake manifold? Is there any danger from such a combination?

Reply:—The present day, high speed engine is not suitable for the use of alcohol as a fuel. Alcohol contains more power but requires more time to release this power, than is allowed in the gasoline engine. The ordinary carburetor is not adapted to the use of this fuel. By these statements we mean that the use of alcohol in the average gasoline engine is not practical.

And to a certain extent it is not practical to use fuel made from a combination of gasoline and alcohol. There

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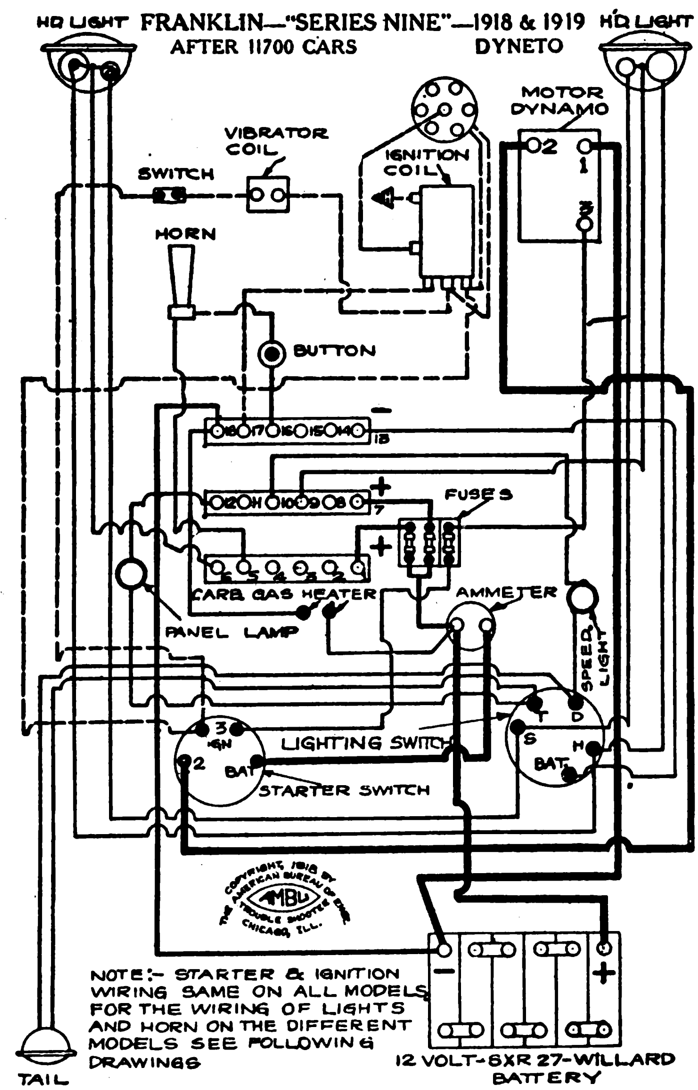
would be no more danger from the use of alcohol than from the use of gasoline.

If alcohol is fed into the manifold in vapor form or through a "water vapor" device, of which there are many on the market, then in all probability you will find that it will reduce the carbon formation. We have mentioned this fact before in the columns of this magazine. Alcohol, if used with moderation in the engine is a good carbon remover. Such alcohol should be tested with the idea of making sure that it has no acid action.

Wiring of Franklin Car

3019

From N. D. Collins, Vermont:—I have a Franklin, Series Nine, 1918 car which is fitted with a Dyneta



Starting and Lighting System. Will you kindly send me a wiring diagram of this machine?

Reply:—The wiring diagram which you request is printed above.

Pops Back Into Carburetor

3020

From T. G., Kansas: We are having trouble regarding a 1916 Chalmers Six 40, Model 32, which is equipped with Atwater Kent Unisparker and Rayfield carburetor. There has always been more or less trouble with this car pumping oil and the plugs getting dirty. We took all the pistons out and widened the ring grooves from one-eighth inch to three-sixteenth inch and installed all new leak-proof rings. We also ground the valves, put in new distributor points and thoroughly cleaned the carburetor and gas line.

After all this was done the car worked very well until a speed of forty miles an hour was reached when it would pop back into the carburetor. Several different men have tried to locate this trouble and no one has been able to do so. We will certainly appreciate any light you can give us on the subject. We have installed six new spark plugs on this car and the gaps are set at .025 and the distributor points at .009.

Reply. You probably realize as well as we that the popping back at the carburetor, at high speeds, is due to a lean mixture. Since you said nothing in your letter to indicate an examination had been made of the carburetor, we assume that you have not investigated this device, beyond giving it a cleaning. We will start with this device and consider possible troubles here.

The upper automatic air valve, held closed normally by a spring rests upon the metering pin. The pin connects through linkage with the lower air valve at the bottom of the carburetor. The problem, obviously, is to obtain either more gas or less air at higher engine speeds. Possibly the metering pin nozzle is clogged Possibly the upper end of the metering pin is worn off and does not allow the metering nozzle to open far enough. We would advise you to put a thin (from 1/100 to 1/64 inch) steel washer between the upper air valve and the metering pin as an experiment. As a second experiment lengthen the air valve spring slightly by stretching it.

You can locate the trouble, if in the carburetor and in any of the parts outlined in the above paragraph by trying to cut off some of the air at the upper air valve while the engine is popping back. Try the same stunt at the lower air valve.

It is perfectly possible, however, that the carburetor is not to blame and that the valves are causing all of the trouble. Try lubricating the valve stems, and tappet stems, first with oil and then with kerosene. Put a tension upon the springs and see if this helps. Measure the valve lift in all cases; perhaps one or more of the cams are faulty. In regard to the last statement the writer has a peculiar case in mind where a trouble, similar to yours existed.

In this case it was found that the valves would close normally and careful tests showed that the clearance was proper. This clearance test was made by turning the engine until the valve to be measured had closed, then the crank was turned one-quarter of a turn and clearance measured. But when the crank was given another fraction of a turn the clearance did not exist, the valve tappet having risen on a hill in the cam and opened the valve again. This opening was only for a fraction of a second but was long enough to cause the trouble.

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We assume that you have timed the valves and ignition correctly.

Soldering Steel and Brass

3021

From C. Swinney, Missouri: The other day I attempted to solder a piece of Ford hood (1913 Model) to a piece of brass. The solder flowed on to the brass but the steel of the engine hood seemed to oxidize or something as soon as the iron touched it and the solder would not stick to it at all. In fact it acted just like aluminum does when trying to solder it with ordinary solder.

I tried using Sal Ammoniac as a flux but this did not help. What was the trouble? If these two can be soldered what flux should be used?

In the first case I used chloride or zinc as a flux.

Reply: We are at a loss to explain why the zinc chloride did not form a suitable soldering fluid for the work. Although steel, and particularly the alloy, vanadium-steel, is difficult to solder, it is more a question of heat and frictional contact than anything else. That is to say, the solder should stick if the steel were heated sufficiently (below a red heat) and the solder were rubbed against it with a clean iron.

We would advise you to try a copper chloride and a zinc chloride solution. Prepare it yourself by obtaining some commercial muriatic (hydrochloric) acid; diluting it with one part of water to three parts of acid and first putting in a small piece of copper. Let the mixture stand until it is a noticeably blue color, then remove the copper and put in a piece of zinc. Leave the zinc in it for about 24 hours and the solution is ready.

This solution will give the iron or steel a coating of copper which should take the solder readily. If ineffectual, add a small amount of sal-ammoniac and try it again.

If you are still unable to get results add a slight amount of acid. If still unable to solder with it you might as well give up the job and have it welded.

Will Not Run on Magneto

3022

From Bertram English, Nevada: I have a 1921 Ford car which will not run on the magneto. It runs very well on the battery but when it is switched on to the magneto it stops. I have gone over all of the wiring and cannot find any short circuit or ground.

I tested out the secondary wires from the coils to the timer and found them all O. K. Can you tell me what the trouble is, and how I can fix it?

Reply: The trouble with your machine is entirely in the magneto or the connections between that unit and the coil box. The mere fact that the engine will operate on the batteries is evidence that the ignition system from the coil to the timer and plugs is in good condition.

The first thing for you to try is to reverse the battery and magneto connections. Remove the two wires, the one from the magneto and the other from the battery where they connect with the porcelain posts at the front of the dash board. Then connect the battery wire with the magneto terminal on the dash. If the engine will not operate under these conditions see if it will run on the "battery" side of the switch when the magneto wire is connected with the battery terminal on the dash. This test will show whether or not the trouble is in the coil box or connections between the porcelain terminal and the box itself. If you find that the engine will run on the battery, no matter whether that unit is connected with the magneto side of the coil or not, then look further for your trouble.

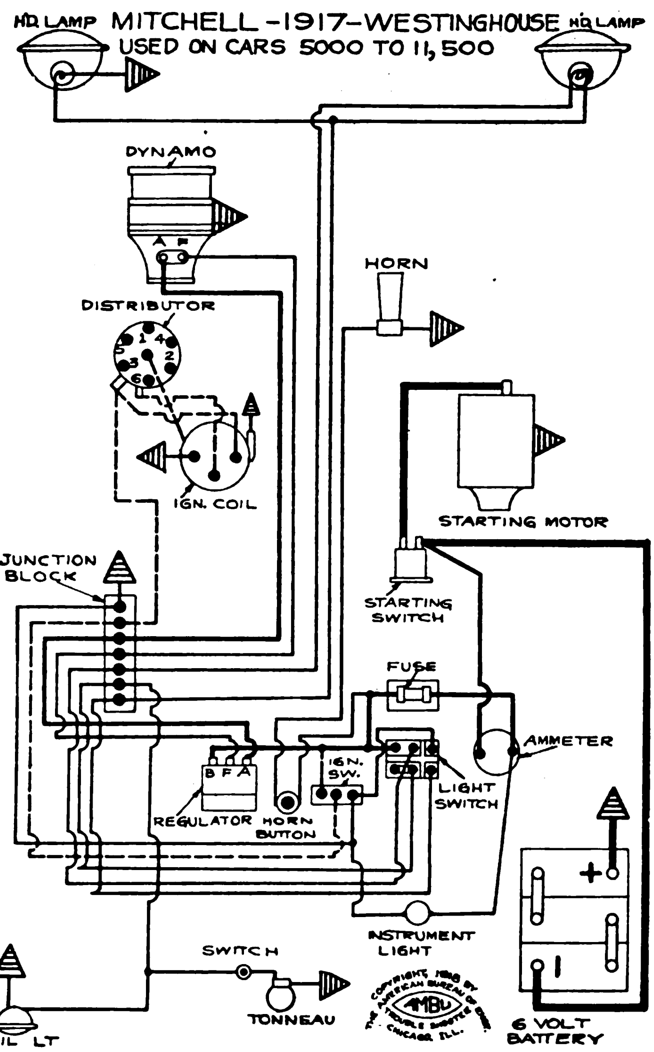
Substitute a new wire for the one which leads from the magneto to the post on the dash. If this does not help, then take off the binding post which is held upon the magneto housing by three or four screws. Take out the post and clean it well. You will probably find that it is covered with lint or dirt and does not make a connection.

If you still fail to find the trouble it is evident that the magneto wires inside are broken or grounded and you will be obliged to take the machine to a service station.

Mitchell 1917 Wiring

3023

O. E. Young, New York:—We print the diagram you require.



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Getting a Willys-Knight in Shape

3024

From C. B. Brown, Connecticut: I am helping a friend with a Willys-Knight Roadster, Model 84, 1916-1917. He bought this machine second-hand and we are now working under difficulties to get the machine in shape. This engine has magneto ignition, battery for starter and lights. I do not seem to be able to find out the make of the magneto, but I do know that the ignition key on the steering column has no effect at all on the ignition. In order to stop the engine we have to pull the choker.

There is one wire leading from the switch to the magneto and I feel that if I run a wire from the bare pole on the magneto back through the switch and ground it (after passing through the switch), the switch ought to work all right.

There is a lone pet cock on the side of the motor which I took for a priming cup, but when the cock is open the motor speeds up. Is this cock used as a "speeder" or for oil for the sleeves or what?

Reply: Unfortunately you did not give us full details regarding the model of your car, but possibly we can give you a clue to work upon. During the year 1916 the Model 84 car suffered many changes in equipment. A number of magnetos were used. The following letters indicate changes in equipment: 84C; 84R; 84T; 84BT.

The trouble in your case is probably due to a poor ground of the magneto when the switch is thrown "off." As a general rule the grounding connection is located on the end or top of the breaker box. Try the following experiment. Start the engine and connect a short length of wire with the binding post on the breaker box (the one which is now wired to the switch). You will probably find that you can stop the engine by grounding this wire to the side of the engine block or by rubbing the wire against one of the magneto poles. If this stops the engine, then you may be fairly sure that the old wire is not properly grounded through the switch.

The old wire should lead to an insulated terminal in the switch and the other pole of the switch should be properly grounded. Since this device is on the steering column there is a good chance that it is not well grounded. Grease, paint, lacquer and dirt in the various joints between the switch box and the magneto will serve to make a poor ground connection.

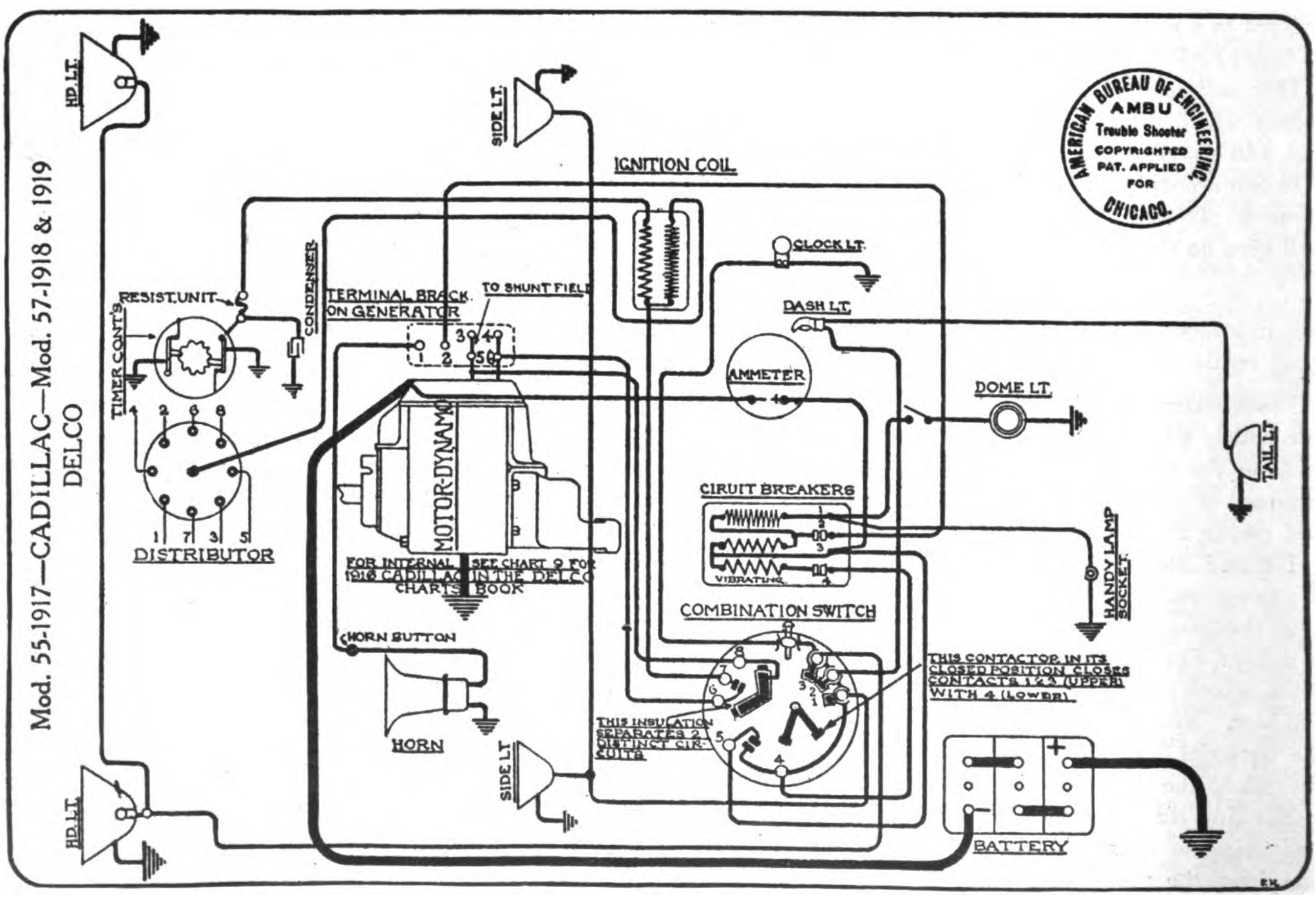
If, in your experiment you find that the grounding of the wire does not stop the magneto from generating current, then try out other connections until you find one which will stop the engine when that terminal is grounded. Connect it with the switch and when the switch is "off" it will or should ground the magneto.

The air cock which you mention is supposed to act as an "economizer" or "speeder." You should connect it in such a way that you can open or close it from the seat and thus save considerable fuel. This cock can be used for priming the engine in cold weather. You can feed water into it occasionally to rid the engine of carbon.

Wiring of Cadillac Model 57

3025

T. Raftery, New York:—The wiring diagram for Cadillac Model 57 is below.



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Engine Overheats

3026

From Owen Reese, Oklahoma: I have a Columbia Special Sport car which is equipped with a "7-R" Red Seal Continental Motor, and I am having trouble with this motor.

When driving at speeds of from two miles to twenty miles per hour, I can run all day without the motor overheating. However, if I run at a speed over thirty miles per hour for about five minutes, the water begins to boil and it is necessary for me to drop down to around ten miles per hour to let it cool.

I have put on all new hose connections, thoroughly cleaned the radiator with soda, but still this trouble persists. This car is equipped with the Thermo-Syphon operated shutters, and there is a good passage for the water to go around the syphon tube. However, this tube is the only thing now I can attribute this trouble to, for the pump works fine.

When letting the engine idle with an advanced spark, making an engine speed of about ten miles per hour if the gears were engaged, there is a scraping or hissing noise, seeming to come from either the first or second cylinders (counting from the radiator back). This noise is not regular, that is, it seemingly does not occur at every rise and fall of the piston, and from this I can hardly think the piston or cylinder is being scored.

It sounds too much like a scraping noise to be a leaking of air on the compression stroke, for there is always two "hisses" or "scrapes" immediately together every time this occurs. This noise never occurs if I fully retard the spark and gas to a speed of probably two miles per hour.

As I try to do all my own repairing, I certainly would appreciate anything you could tell me, relative to a remedy.

We are of the opinion that all of your trouble is caused by the radiator shutters which do not open fully at the higher engine speeds. Possibly, too, the fan is not adjusted tightly enough. We would advise you first, to disconnect the shutters from the thermo unit and fasten them open. If the trouble still persists, examine the fan action. If no trouble is found here look to the timing of the spark.

When fully retarded the spark should occur at top dead center. When running at high speeds it should be advanced as far as possible without causing the engine to knock.

There is still another chance for trouble. Examine the exhaust valves. Grind them in if necessary. The second part of your letter might indicate valve trouble. Be sure that the exhaust valve clearance is not too great. Exhaust valves should open their maximum and if the clearance is too great they will not and the burned gas, particularly at high speeds will overheat the engine.

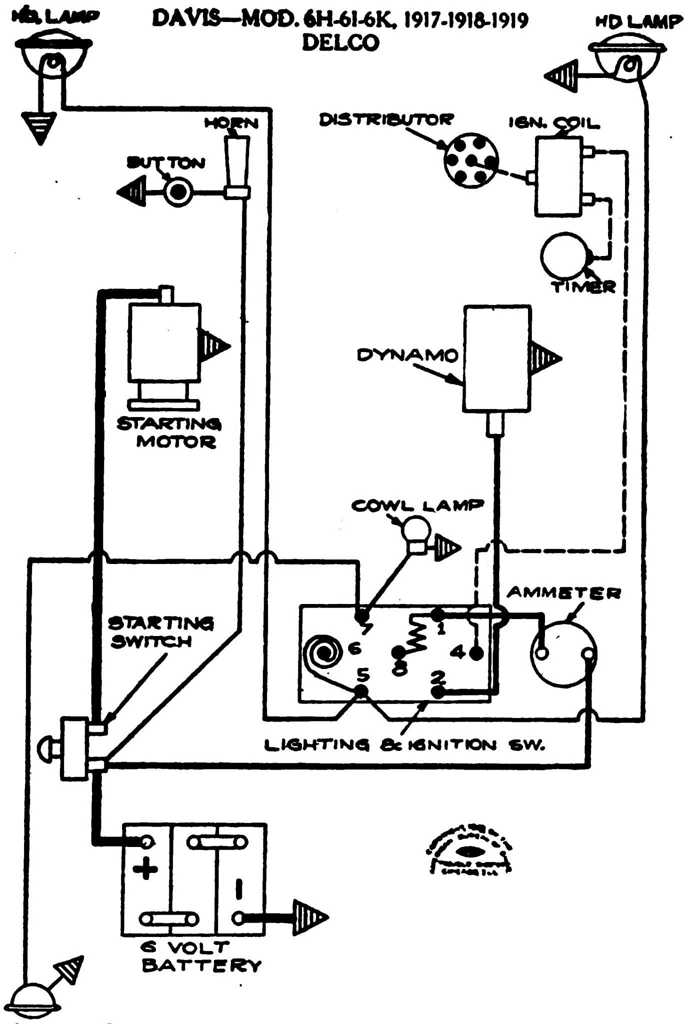
If none of these improper conditions are present then check the valve timing. Advance the valve timing so that the exhaust stays open slightly longer. (Try turning the cam-shaft gear one tooth ahead in its direction of rotation.)

The fourth paragraph of your letter indicates either valve or piston leakage. Possibly a broken ring since this would cause a click or a scraping noise. The fact that the scrape is not regular would indicate a broken ring too.

Wiring of Davis, Model 6-H

3027

From James E. Canavan, Wisconsin.—I have a Davis car, which I think is a 1917 Model, or later. The wiring has been disturbed and I would like to have a diagram of the starting and lighting system if you will kindly send it to me.



Reply:—We reproduce herewith a diagram which gives the wiring of 1917-1918 and 1919 Davis cars.

Knock in Nash 1920

3028

From D. D. Hann, Pennsylvania: I have taken up the bearings carefully in my 1920 Nash car, and although when running slowly it runs very well, when going about twenty or twenty-five miles an hour there is a knock. This knock sounds something like tapping with a hammer. Can you tell me what might be the cause of this knock, and how I can remedy it.

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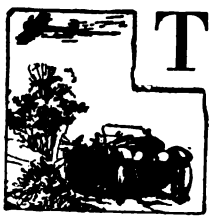
Reply: There are a great many chances for knocks under the conditions which you outline. We would say, as a first guess, that it is caused by a loose wrist pin. If not this, then the chances are about in the following order:

End play in the connecting rods;
Broken piston ring.
Piston slap.
End play in cam-shaft.
End play in crank-shaft.
Loose flywheel.
Loose members in the clutch.

If the engine parts as outlined above seem to be all right examine each of the units such as the pump, the generator, the fan. If still troubled you might work back into the transmission because this large engine contains so much metal that vibration, and knocks travel from one end to the other very easily.

AUTOMOBILE ARITHMETIC

By Homer S. Trecartin



THE problem of finding out how fast the engine is turning over for any given speed of travel of the car is one of simple arithmetic; but it is one which seems very confusing to many drivers and mechanics. The simple process to be worked out is given below.

Assume that it is wanted to find out how fast the motor revolves when the car is making thirty-seven miles an hour. This may be stated: "How many revolutions per minute for motor if car goes at thirty-seven miles per hour?" The terms we can grasp easily because we are accustomed to terms in miles per hour and revolutions per minute, but we have to figure them both out at either hours or minutes, so let us say, "How many revolutions per hour at thirty-seven miles per hour?"

We have to find how many revolutions the motor makes for each mile the car travels. The gear ratio of the rear axle must be known. Assume that it is "five to one." That is, the bevel pinion, on the end of the shaft, has one-fifth as many teeth in it as the bevel gear. So we must know that the rear axle and therefore the rear wheels, go around once for every five revolutions of the motor.

There are 5,280 feet in a mile. If we know how many feet the rear wheels travel at each revolution, we can easily find how many turns they make in one mile.

The circumference of a circle is equal to the diameter multiplied by a number called "Pi" which is 3.1416. You could not figure this out in a hundred years if you forget it, so don't forget it. Assume the tire on the rear wheel we are considering is thirty inches. To get the distance around the tire multiply this diameter by 3.1416. The result is 94.25 inches (roughly). This is the distance the car goes at each revolution of the wheels. Let us find how many inches in a mile. 12 times 5,280 gives 63,360.

Dividing the "length" of our tire into this distance shows us how many times a tire revolves to go one mile. The answer is 660.

We found that the motor goes five turns to each turn of the wheels, so we have 5 times 660 equals 3300 which is the number of revolutions the motor makes for each mile the car goes.

If the car goes at one mile an hour, the motor would make 3300 revolutions per *hour*. If we divide this by sixty we will get fifty-five, which gives us the revolutions per *minute* at one mile an hour. Now, of course, to find the revolution per minute of the motor at any number of miles per hour that the car goes, we need only multiply fifty-five (R. P. M. at one mile an hour) by the number of miles per hour to obtain our motor speed.

Taking our speed of thirty-seven miles an hour multiplied by fifty-five gives us 2035 for the motor speed.

Problem: Find Engine Speed of car going at thirty-seven miles per hour, if Differential Gear Ratio is Five to One, and Tires are 30 inches in Diameter.

Solution:

"A" *Wanted*—Circumference of 30 inch Tire
(Circumference of Circle = Dia. × Pi)
30 x 3.1416 = *94.248*

"B" *Wanted*—Number of inches in a Mile
(One Mile = 5280 Feet)
5280 × 12 = *63,360*

"C" *Wanted*—Number of Rev. 30 inch Tire Makes in One Mile (94.25 inch to One Rev. (See "A")
63,360 ÷ 94.25 = *660*

"D" *Wanted*—Number of Rev. Motor Makes in One Mile
(Bevel Gear Ratio is 5 to 1)
660 x 5 = *3300*

"E" *Wanted*—Rev. per *Min.* of Motor at One mile per *Hour*
(One hour = sixty minutes)
3300 ÷ 60 = *55*

"F" *Wanted*—R. P. M. of Motor at thirty-seven M. P. H.
(See "Problem")
55 × 37 = 2035 = ANSWER

WATER IN THE CRANKCASE

By R. L. Prindle

With the approach of cold weather there is condensation of moisture in the crankcase, forming water, which is a product of combustion, and this finds its way past the pistons into the crankcase where it interferes with lubrication. In summer weather this moisture passes out of the breather pipe unnoticed in the form a slight steam. When the crankcase is fanned by cold blasts condensation is rapid, the water then mixes with the oil, forming a sort of emulsion. The only remedy lies in draining it about every four weeks.

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Automobile Storage Batteries

The First of a Series of Articles Which Will Treat Upon a Subject of Vital Interest

By Sidney F. Walker, R. R. N.

THE storage battery has been of varying importance since the motor car came on the market. During the early years it was employed, in competition with the dry cell, to furnish currents for the electrical ignition apparatus that was then in use. It got into disgrace for this purpose after a certain time, and in the United Kingdom at any rate, gave way almost entirely to the magneto for ignition purposes.

The dry battery which competed with the storage battery in the early days was discarded, in the United Kingdom, the writer believes, sometime before it was given up in America. In America some very good dry cells were made, by The National Carbon Company, and other firms, that were put up into batteries and used for lighting the cars, as well as for ignition purposes and did well; the makers of the dry cells completely got over the difficulties that were felt in the earlier days of primary batteries, of constructing individual cells so exactly alike, that they could be connected in parallel.

In the earlier days, connecting any type of primary battery cells in parallel was fatal to their life; they were furnishing current, flowing through each other, when they were not supposed to be at work at all, and so ran down very quickly. The writer had some dry cells brought to his attention a little before the war, which were specially made for motor cars and similar work, and he subjected them to severe tests in parallel running, which they stood quite successfully.

Necessity for Storage Battery

The storage battery has come to the front again in connection with motor cars, since the plan of lighting the car by electric lights, and starting it by an electric motor has become general. For lighting the lamps when the car is standing, a battery of some kind is necessary, unless the engine is to be kept running wastefully, to furnish the current for the lights; also some form of battery is required to furnish the current required by the motor in starting up. The requirements of the starting motor have, the writer believes, taught makers and users of motor cars a well needed lesson in the matter of the size the storage battery should have for all kinds of work.

In the writer's opinion, the failure of the early storage batteries employed for ignition purposes, was due to the cells being too small. When the motor car engine consisted of one or two cylinders, and ran at the moderate speed, (in the neighborhood of 1000 revolutions, per minute), that ruled in those days, the comparatively small cells that were supplied with ignition outfits, ought to have stood up to their work, though they would have done it better if they had been larger. As the number of cylinders in the engine increased, and the speed of the engine also, the demand for current from the storage battery or dry cells increased very rapidly, and those then supplied with ignition outfits could not stand up to it.

It should be understood that with both dry cells, and storage batteries, there is a certain current they can supply for a certain number of hours per day, and will go on supplying for a fairly long time, if they get a full night's rest; when that current is exceeded, the batteries are stressed, failures are apt to be more and more frequent, and trouble more and more common. The current that either dry batteries or storage batteries will furnish under these conditions, varies practically with the size of the battery.

Current Output Must be Heavy

It should also be noted that with both dry cells and storage batteries, the sudden demand for a very large current, in comparison to the size of the cell, even for a very short time, runs the battery down very much, and it will only recover after considerable rest, or the equivalent, as will be described later.

Starting a motor car engine, on cold mornings in winter, after the engine has been in a cold garage all night, is a severe trial for any battery that is working near its limit. Considerable complaints were made when electric starters were first introduced, that the storage batteries employed would not stand up to the current required; in too many instances, batteries that were then not doing too well in the matter of furnishing current for ignition, were put on to lighting and starting, without any increase in the size of the cells; the lighting current might have been furnished with care, but the starting current very often broke the battery down completely.

Every one who has driven a motor car knows how difficult it is to start the engine on a cold morning, under the conditions named; the power required is many times that necessary to start up when the engine is moderately warm, when it has only had a rest on a fairly warm day, or even a short rest on a moderately cold day; and the increased effort which has to be put out by manual labor when starting, has to be imitated by increased current furnished by the battery.

It should be mentioned also that the low temperature in which the battery has been left during the night is against furnishing the larger currents required of it in the morning. Experience has taught motor car users to

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warm their garages during the night, in winter, and to employ storage batteries of sufficient size to furnish the largest current that may be demanded under the coldest conditions likely to rule. The larger storage batteries do not cost a great deal more than the smaller ones, the total cost is only a small fraction of that of the motor car and its other accessories and the larger cells stand up to their other work much better than the smaller ones.

Dry Batteries and Storage Batteries

Before going further it may be as well to explain the difference between dry batteries and storage batteries, and why dry batteries are unsuitable for motor car work at the present day. The dry battery is a primary battery; it contains within itself all that is necessary to furnish an electric current of a given strength and pressure. The storage battery requires that an electric current of a certain strength and pressure shall flow through it for a certain time before it is able to furnish a current of a certain strength and pressure. The product of the strength and pressure of the current furnished by the storage battery on discharge is always less than the product of the strength and pressure of the current employed in charging it; the efficiency of the storage battery is rarely more than from fifty to fifty-five per cent; that is to say the product of the strength and pressure and time furnished by the storage battery is only from fifty to fifty-five per cent of the similar product of the current charging it.

That is where the primary battery would have come in if it could have been made of sufficient size, and the materials it consumed could have been sufficiently cheap.

The Primary Battery

The primary battery may be compared to the water that is ready to flow over a Fall, while the storage battery may be compared to a steam boiler and engine, or to an internal combustion engine; the water above the fall is ready to furnish power in descending to the bottom of the fall; all that is necessary is to provide means for using the falling water, and allowing it to expend its energy usefully. Similarly the primary battery is ready at any moment to furnish electrical energy if an electric circuit be formed if which it is a part.

The steam engine and boiler, and the internal combustion engine both require that fuel should be burnt before mechanical energy can be obtained from them; and similarly the storage battery requires that electrical energy shall be expended, before it can furnish electrical energy. The dry batteries on the market are all developments of the LeClanchá battery that was used for so long, as a wet battery, for furnishing current for electric bells, telephones, and similar apparatus. It consisted of a glass or earthenware jar containing a solution of sal-ammoniac (chloride of ammonium); also a rod of zinc dipping into it, and a cylindrical jar of porous earthenware open at the top. In the porous jar, or porous cell as it was usually called, a flat carbon plate stood, the space around it being filled with a mixture of carbon from the gas works, and oxide of manganese; the carbon and oxide of manganese were in very small lumps about the size of a pea, or small bean; it was important that there should be no dust.

The top if the carbon plate had a lead cap cast on it carrying a brass terminal screw and the top of the porous cell was closed by running in molten pitch, one or two short lengths of small glass tubes being embedded in the pitch to allow for the escape of gas from the cell. The zinc rod had a copper wire soldered into its upper end.

When the battery was at work a small portion of the zinc combined with the oxygen of the water, and the chlorine of the sal ammoniac, forming zinc oxide and zinc chloride, and the other components of the sal ammoniac solution were delivered at the surface of the carbon plate inside the porous cell.

Decomposition of Electrolyte

It is a property of all galvanic batteries, primary or storage, that the currents flowing through them split up the liquids through which they flow into their components; water is split up into oxygen and hydrogen, chloride of ammonium is split up into chlorine and the hypothetical metal ammonium. It is a property again of galvanic action, when currents flow through liquids, that the gases turn towards the plate where the current enters the liquid, in this case the zinc rod; and the other substances, the metals principally are carried to the plate where the current leaves the liquid, in this case the carbon plate.

Hence, the oxygen and chlorine turn to the zinc rod and combine with it, the hydrogen and the ammonium are carried tô the carbon plate. The ammonium is resolved into its components ammonia and hydrogen, and is delivered in that form at the carbon plate. The delivery of the hydrogen and ammonia at the carbon plate would reduce the strength of the current the battery could furnish, by setting up a back pressure, by contact with the carbon plate unless it was got rid of in some way the oxide of manganese is placed around the carbon plate for this purpose: It is a substance rich in oxygen, that will deliver up a portion of its oxygen under certain conditions, and the presence of hydrogen in a powerful state in the neighborhood of the carbon plate is one of the conditions under which it will do so; the oxide of manganese is reduced to a lower oxide, and the oxygen set free in this way combines with the hydrogen to form water; the ammonia gas comes away freely, escaping through the little glass tubes in the top of the porous pot.

The quantity of ammonia gas is not great, and it is usually sufficient to allow it to come away freely in this way, to prevent it setting up any appreciable back pressure. When a battery of this kind is worked hard, however, and the ammonia gas comes away very freely, it may be smelt for some distance away.

Secondary action take place in the liquid in which the zinc rod and the porous pot are immersed.

The ammonia gas does not all get away inside the

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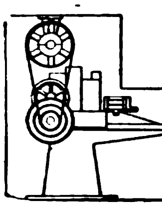
porous pot, some of it is dissolved in the liquid, and combines with the zinc oxide, and the zinc chloride, forming two very troublesome salts zinc ammonic chloride, and oxy-ammonic chloride, some of the oxygen from the liquid taking part in this. These secondary salts cause trouble principally by crystallizing out in the pores of the porous pot, thereby preventing the flow of liquid through them.

The Ford Oiling System

Suggestion for Preventing the Excessive Lubrication of the First Two Cylinders

By Frank Chalmers



IN this article I will try to give a remedy for all Ford oiling troubles, and particularly for those troubles arising from over-lubrication of the first two cylinders.

One couldn't ask for a more simple system of lubrication than that used on the Ford car. The designer of the car evidently believed that the more things a part could be used for, the better. The fly wheel of the Ford car does many duties besides acting as a balance wheel for the engine. It forms a part of the clutch, it functions as a part of the gear-set, it is the main part of the magneto, and lastly, fulfills the function which is the subject of our story, it is the main unit of the oiling system. The flywheel on this car acts as a large centrifugal pump for forcing the oil into the reciprocating and moving parts of the engine and transmission.

Operation of Present System

When the engine is operating, the flywheel picks up a large volume of oil from the bottom of its housing and by centrifugal force throws it upward and around the top of the housing. At the right side of the housing, as one sits in the seat of the car, is an oil tube, belled out to a funnel shape and this funnel catches the oil as it is thrown off from the flywheel. The oil tube carries the lubricant to the front of the engine and pours it over the timing gears.

From the timing gears the oil flows into the first splash pan and the first connecting rod sprays it around at the front of the engine. The surplus oil flows to the second splash pan where it receives the same treatment; then to the third and finally back to the flywheel housing again to begin the cycle. The first cylinder is usually over-lubricated; the second often is over-lubricated; the third is about right and the fourth is in the same class.

It has been said that if piston rings and pistons are properly fitted, then it makes no difference whether the lower portions of the cylinders are over-lubricated or not and doubtless the statement is true, but that does not comfort the man who does not have the time or the money to refit pistons and rings every few months. Nor does it help the man who owns an engine with scored cylinders.

In many Ford cars the flow of oil to the first two splash pans is so great that the first two cylinders will carbonize even though the greatest care is given in fitting the rings.

If the oiling system is in good condition over-lubrication is bound to result but many Ford owners are troubled with conditions exactly the reverse; under lubrication. The reason for this is the clogging up of the oil tube by dirt and pieces of lint from the brake bands.

If the oil tube is choked with dirt of foreign matter, then you can hardly expect the system to work, no matter whether it is remodeled or not. For this reason, before making any alterations in the system clean the engine thoroughly. Since the engine must be dismantled to make the change, which will be hereafter suggested, you will have ample chance to make the cleaning thorough. If the brake bands show a tendency to fray on the sides, throw them away and install a set of bands which will not ravel or fray at the sides. The best is none too good. You can't expect first class results from third rate stuff and a few extra cents added to the cost of the brake linings in the transmission may save many dollars in engine repairs.

The size of the oil tube is ¼ inch and this ¼ inch hole is ample to supply all the oil for the timing gears and splash pans if properly distributed. The only trouble, as we have seen, with the present system is that it is not properly distributed.

Exposing the Oil Tube Funnel

Dismantle the engine to the extent of removing the timing gear case cover, the oil pans and the cover of the transmission. By the cover of the transmission, I refer to the whole of the upper part of the transmission housing. If this is done, then the oil tube funnel is exposed, and the cleaning of the oil system as well as the base of the engine is made possible.

Drain off all of the old oil and use about two gallons of fresh kerosene oil to clean the under part of the engine and the transmission. Spray the kerosene all over the working parts, through the oil tube and wash down the flywheel with it. If you place a tin vessel below to catch the kerosene as it leaks out you can use the kerosene again but be sure to strain it through a fine cloth before you use it the second time. A good, tight oil or

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grease gun with a fine nozzle is just the thing for squirting the oil into the engine. Clean the engine thoroughly with the oil! I repeat this statement because it is vitally important.

After you are sure that the engine is clean, mark the oil tube, which you can see from the bottom, running along just below the cam-shaft, with three tiny punch marks. These punch marks should be opposite to the big ends of the first three connecting rods.

Boring the Oil Tube

With a newly sharpened twist drill, ⅛th of an inch size, bore the three holes into the oil tube as indicated by the punch marks. The slant of the drill should be such that the hole will point toward the lower end of the connecting rod when that member is at its lowest point. By this means an even distribution of oil is assured to each oil pan. (The fourth pan, you will note is a part of the flywheel housing and will need no oil hole in the oil tube.)

The next thing to do is to fit a plug into the end of the oil tube where it opens into the timing gear housing. For this purpose use a piece of brass and fit it carefully so that it will not fall out of place and into the gears and so make a wreck of the engine. Before driving this plug into place bore a hole into it. This hole should be 9/64 of an inch in diameter.

The total area of the four holes, if these directions have been followed, will be slightly greater than the area of the ¼ inch oil tube which may mean that the timing gears will get a slightly larger proportion of oil, however this is an error in the right direction.

After all of the holes have been bored and the plug is ready to be driven into the end of the tube, flush out the tube with kerosene. For this purpose be sure to use an oil gun because there are sure to be small particles of brass turnings left inside the tube after boring, and it is necessary to force them out. The tube may then be driven in and fixed by a set screw.

Checking the Work

In order to check over the work and to be sure that the holes are clean, pour about a quart of lubricating oil into the tube and have a friend watch to see that oil runs out of all of the holes. Assemble the engine and before replacing the transmission cover pour about a quart of oil into the oil tube to fill all of the splash pans.

Replace the transmission cover and fill the system with pure oil, being sure, always, to strain the oil before it is put into the engine. If you will make a practice of cleaning the system twice during the season you will be pleased at the results. Your engine will run without collecting surplus carbon in the first two cylinders.

When it comes time to clean the oil tube simply remove the plug in the end and run a brush through it. A good brush for this work is sold for cleaning rifles.

With such a remodeled system you cannot use a heavy grade of oil, else the oil will be apt to thicken in the tube and your engine will not receive sufficient lubrication.

September, 1921.
Sacramento, Cal. Seventh Annual Show during State Fair. Passenger cars, trucks, tractors, accessories and agricultural implements. State Agricultural Society.

September 5th to 10th
Indianapolis, Ind. Annual Automobile and Accessory Show. Indianapolis Auto Trade Association.

October 1st to 8th
Cincinnati, Ohio. Annual Automobile Show. Passenger cars and accessories.

November 14th to 19th
Jersey City, N. J. Annual Automobile Show. Hudson County Automobile Trade Association.

January 7th to 13th
New York, N. Y. National Automobile Show. Madison Square Garden. Auspices N. A. C. C.

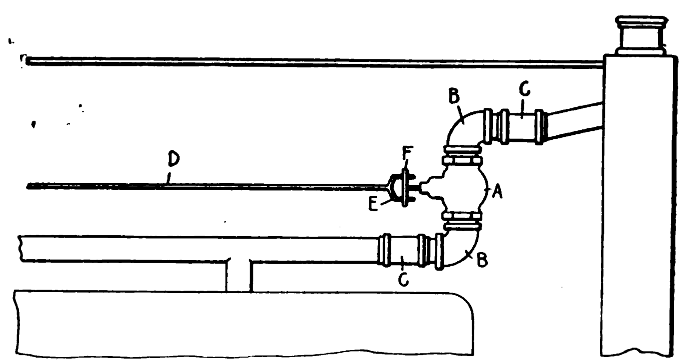
January 27th to February 2nd
Chicago, Ill. National Automobile Show.

TO REGULATE COOLING WATER

By Geo. G. McVicker

DURING the winter time when it is an advantage to have a part of the cooling arrangements of a truck or auto shut off, the following will provide for such a device and is one that will allow for regulating the flow of the water from the motor to the radiator.

The hose between the motor outlet and top of the radiator is removed and if room exists, a globe valve A with two elbows B and short nipples C of the proper size are attached. A rod D with a forked end E is attached to the hand wheel F of the valve and extends back to the dash where it may be reached by the driver.



Should there not be room for this arrangement as shown in the cut, the valve only may be inserted in the hose, and the shut off operated with a swivel jointed rod from the dash or else left to be adjusted only by turning by hand when the motor hood is lifted.

Either arrangement makes a satisfactory way of controlling the heat held for efficient operation as the water flow is easily increased by opening the valve.

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NOT so long ago shops had to be especially equipped to remove worn out truck tires and even with the necessary press it was no easy job.

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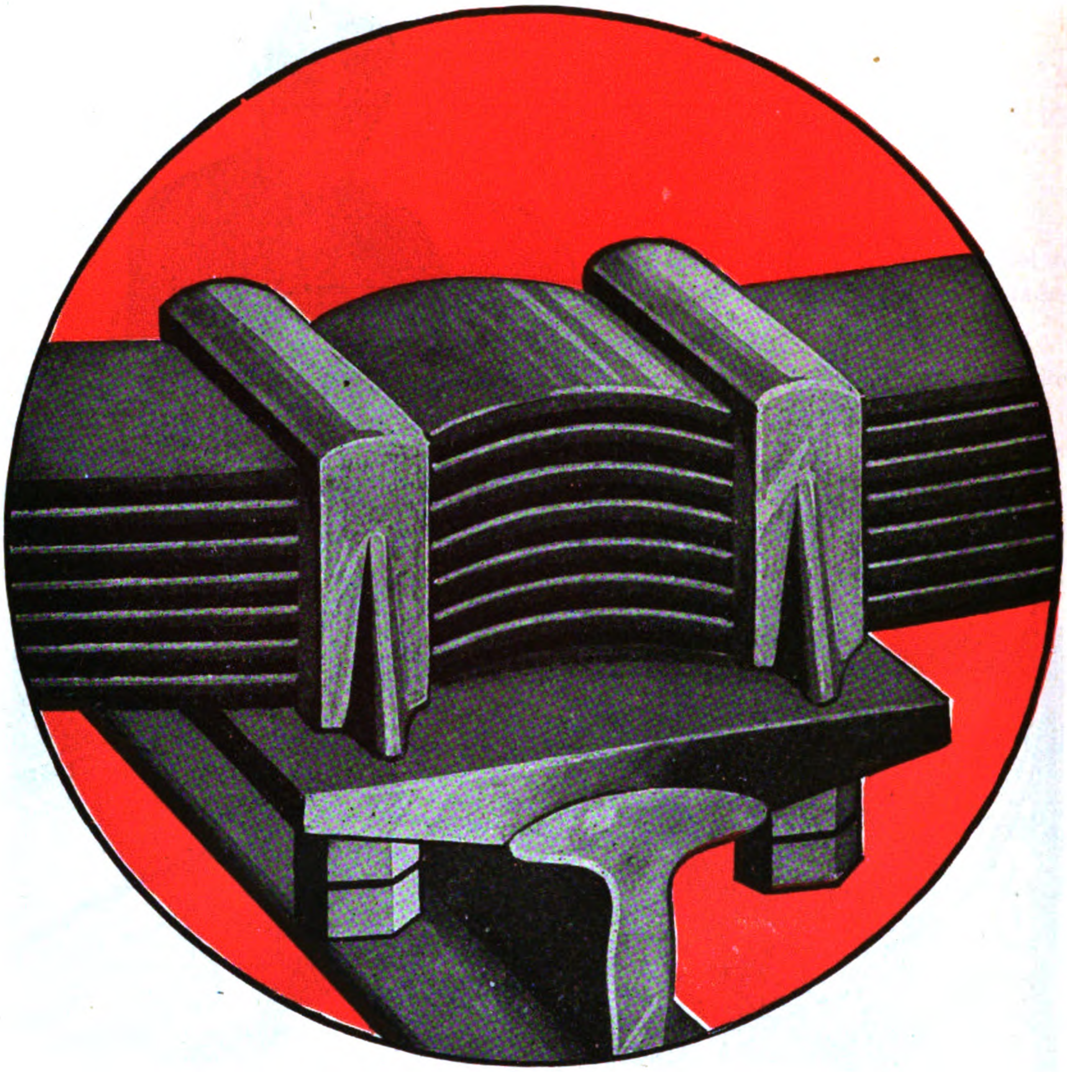

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A fair profit for yourself? Ease of installation? Satisfaction for your customers?

All these you find abundantly provided in both rings bearing the famous Star-K brand—the Star-K Inland and Star-K Oiless Piston Rings.

Right prices fix your profit at a most generous figure.

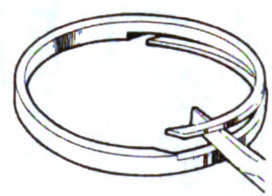
Ease of installation is assured by accuracy of manufacture, each ring passing a micrometer test that allows a variance of not over ½ of one thousandth of an inch in the width.

Satisfaction for the car owner must result because of our special method of heat treatment which absolutely "sets" the circular form. "Star-K" Piston Rings are round when they go into the engine—and they stay round in spite of the intense heat from the explosions.

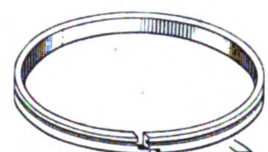
Star-K Inland Piston Rings are in one piece, cut spirally. The overlapping ends prevent a gap occurring in the ring at any time —and "they follow the wear." These flexible ends also easily adjust the rings to the uneven form of out-of-round cylinders.

Star-K Oiless Piston Rings are popular priced and scientifically designed to stop that old bug-bear of the motorist —oil pumping. There are two "oil" grooves—one in the center to retain oil for lubrication; the other on the lower shoulder to scrape excess oil from the cylinder walls. The velvet finish of the contact surface assures unusual quick seating.

With these two Piston Rings you can meet every requirement of every motor and every demand of every motorist.



The "spiral cut" of Star-K Inland Piston Rings is an exclusive feature that enables them to follow the wear.



The two grooves in Star-K Oiless Piston Rings stop oil pumping.

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Price, $7.50 each.

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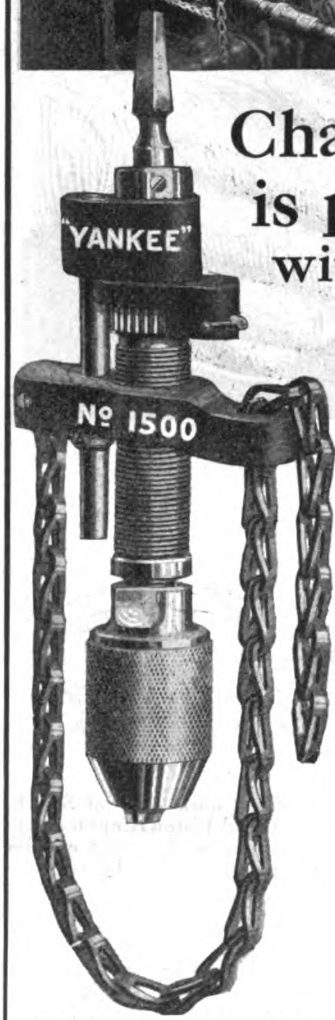

Chain drilling is profitable with a "Yankee" No. 1500

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"No hand feeding! No pressure adjustments! I don't have to think of feeding at all—whether drilling fast or slow, with large drills or small. The 'Yankee' Automatic Friction and Ratchet Feed relieves me entirely of that. All I have to do is turn the brace.

"The chain is tightened and the drill quickly set to the work by the 'Yankee' Friction Feed and then automatically fed by the 'Yankee' Ratchet Feed.

"It's the only chain drill with automatic friction and ratchet feed. The same feed is used in the 'Yankee' Bench Drills"

No. 1500 Three-jaw chuck for round shank drills up to ½ in.

No. 500 Two-jaw chuck for square shank drills up to ½ in.

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"YANKEE" TOOLS

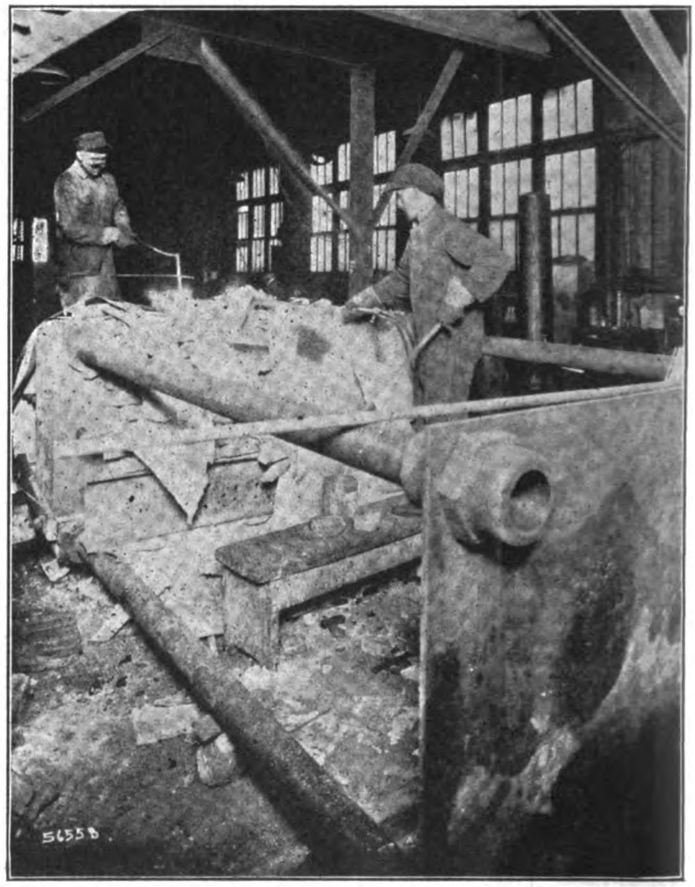
Make Better Mechanics

WELDING BASE OF 250-TON HYDRAULIC PRESS

A TYPICAL instance of the practical application of oxy-acetylene welding in repair and maintenance of plant equipment is illustrated in the accompanying cut, which shows operators welding the base of a 250-ton hydraulic press that was badly broken in service.

The heavy base was broken entirely through, the fracture extending diagonally across the center. To bring the parts together properly for welding it was necessary to bind them with a chain and supplement this with a steel plate securely bolted to the uprights.

The necessary chamfering was done to secure penetration and proper bonding throughout the joint, and an improvised preheating furnace was then built up of "I" beans and loose brick. Approximately 126 pounds of charcoal and 200 pounds of asbestos paper for covering were used.



When the base was brought to proper heat, openings were made in the asbestos sheeting to afford access to the work in operating the torches and filling rods, and the actual welding was begun. After the work has progressed to a point where the girding interfered with the operators, the chain was removed, the steel plate being then sufficient to keep the parts properly aligned. There were 44 inches of linear welds (3½ inches deep) besides an area of 8 in. x 4½ in. that was missing and had to be built up.

The job was handled throughout by two operators using No. 4 Oxweld blowpipes with No. 15 tips. Approximately 250 pounds of cast iron alloy rods were used.

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There is Only One Original "oilSEALing" Groove

THE Original "oilSEALing" angled groove is found only in the No-Leak-O Piston Ring. It fills with new oil and empties on each stroke maintaining a constant oil seal without clogging; and when reversed in the top groove of each piston it keeps kerosene and unvaporized gasoline out of the oil pit.

No-Leak-O Piston Rings give both proper Oil Control and High Compression in *each individual ring*. They are made in one piece -- easy to install -- quick seating -- individually tested and guaranteed for accuracy -- made of finest material and guaranteed against breakage.

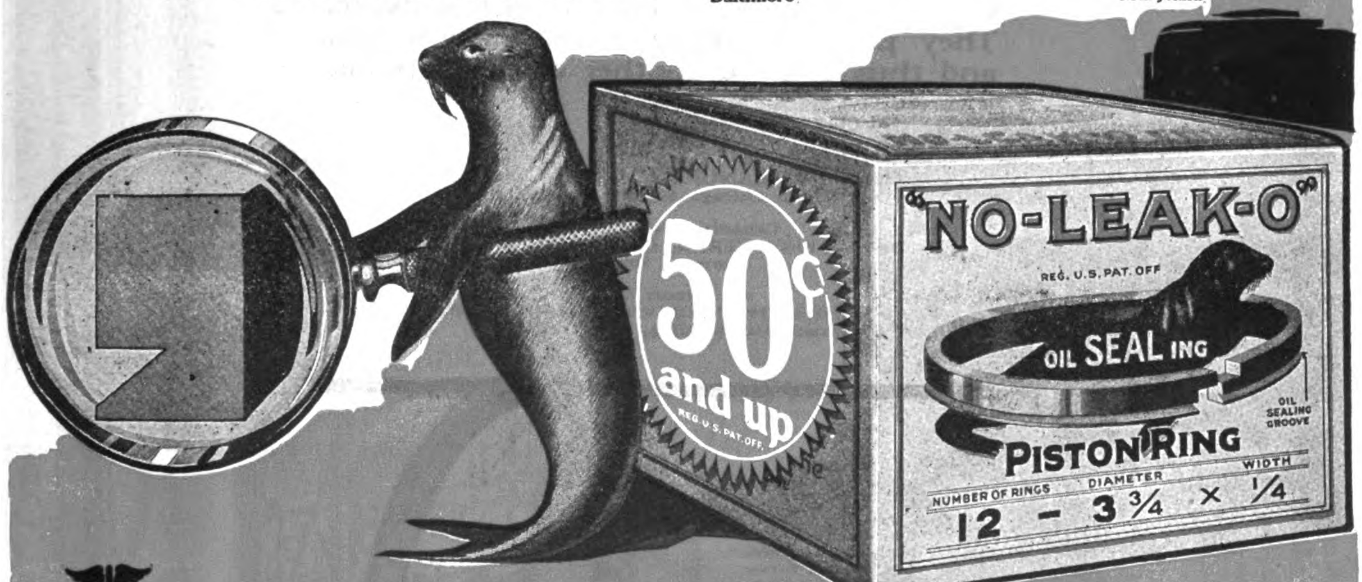
Over 200 reliable jobbers and dealers carry No-Leak-O Piston Rings in all standard sizes and oversizes. If yours does not, send us his name and address.

Free Literature

Write for free booklet "The Piston Ring Problem and Its Solution." -- Also price list and special offer to the trade. Let us tell you how to "cash in" on our 1921 Saturday Evening Post advertising. WRITE TODAY.

IMPORTANT: In buying Piston Rings insist on the genuine No-Leak-O with the original "oilSEALing" groove, packed in this standard package bearing the famous ring and seal, our registered trade mark.

NO-LEAK-O
PISTON RING COMPANY
Baltimore Maryland



NO-LEAK-O Piston Rings
WITH THE ORIGINAL OILSEALING GROOVE

AUTOMOTIVE EQUIPMENT ASSN.

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Gill

One-piece Piston Rings

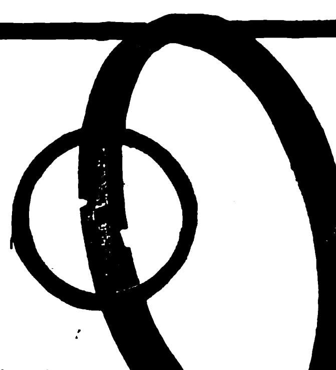
prevent loss of power

BECAUSE: they press so snugly and firmly against the cylinder walls at ***all*** points that gas cannot waste past them. All of the fuel is compressed into power. And they do this satisfactorily through thousands of miles of service because they are cast ***individually*** from a special gray iron that retains its elasticity and tension under the stress and strain of the hardest usage. They prevent carbon accumulation too, and thus remove another cause of power loss.

THE GILL MANUFACTURING COMPANY,
8300 South Chicago Avenue, Chicago, Illinois

Canadian Manufacturer:
BROWN ENGINEERING CORPORATION, Limited
Toronto, Ontario

Sole Export Agents:
AUTOMOTIVE PRODUCTS CORPORATION
Woolworth Building, New York, N. Y.



Identify the Gill One-piece Piston Ring by the joint, but do not measure its merit by the joint ***alone***.

39 Branch Offices prepared to give practically 24-hour service to the entire trade. Whenever possible, however, dealers should order through their jobbers.

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Have They Got the Habit?

Do the motorists who pass your place of business stop there for air and water or do they go on to the other fellow?

Don't forget they get the habit, and where they stop for convenience they go to buy.

ROMORT
AIR AND WATER
STATION

Will bring you the passing business at no cost to you of time and service, as the ROMORT STATION enables the motorist to help himself and saves you the cost of wear and depreciation on hose and attachments.

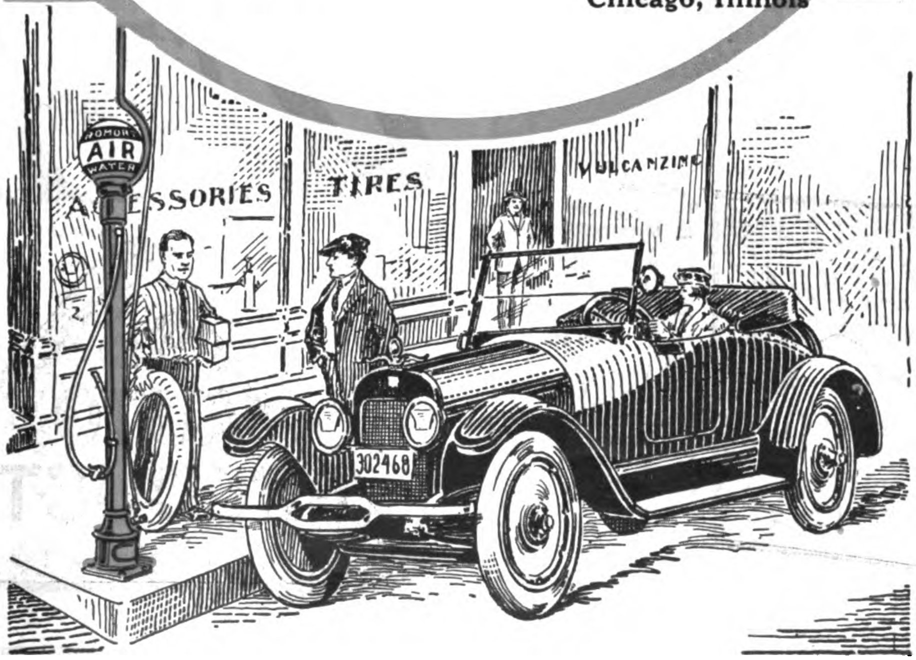
In addition to the air and water service, the ROMORT STATION gives you an attractive electric lighted lamp post that advertises your business day and night. This alone is worth more than it costs you.

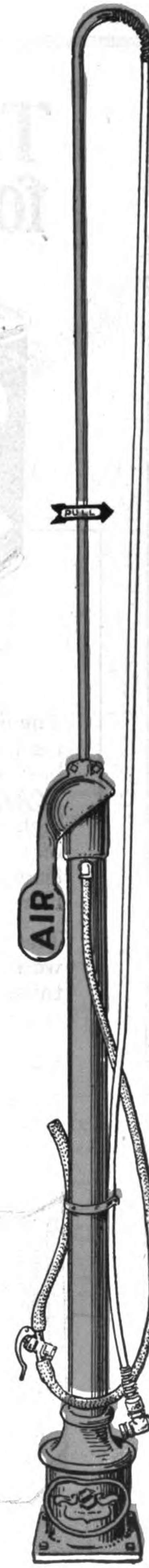
Built in five styles, including models for outside wall installation and interior ceiling installation.

Your name on a postal card addressed to our Sales Dept. will bring full details by return mail.

Manufactured by
ROMORT MFG. CO.
Oakfield, Wis.

Sales Dept.
THE ZINKE COMPANY
1323 Michigan Ave.
Chicago, Illinois





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There's a *Whiz* Product for Every Motorist's Every Need

—and 97 Other *Whiz* Products

The dealer with ideals about serving his customers with only the best will cheerfully recommend *Whiz* Products, because the high quality and utility which is responsible for *Whiz* dominant leadership will strengthen and increase his trade.

The same qualities which have won the instant and lasting enthusiasm of every user of *Whiz* Auto-Products have been the dominant factors in the up-building of profitable business for many thousands of *Whiz* dealers.

They Sell—
They Satisfy the Customer—
They Are Profitable—

These facts are known to every one of the more than 60,000 dealers who are handling *Whiz* Products.

If you are not handling the *Whiz* line, you should—you should know it and all that it can do for you as a prestige and profit builder—let us tell you what it it has done—is doing now for *Whiz* Dealers all over the Country.

Send for catalog 260—in colors describing the entire line.

The R. M. Hollingshead Co.

General Office and Factories, Camden, N. J., U. S. A.
BRANCH OFFICES AND WAREHOUSES:
New York Boston Chicago Pittsburgh Cincinnati Atlanta Kansas City St. Paul Houston San Francisco Los Angeles Portland Seattle Spokane

Whiz
REG. U.S. PAT. OFF.
98 AUTO PRODUCTS

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GETTING OUT OF TIGHT PLACES

H. S. Trecartin

A HOPELESS feeling often comes over an automobile driver when he finds himself unable to jockey his car into or out of a place where he is crowded for room. There are many drivers for instance, who will ride a block or two beyond their destination because they feel incompetent to work their car into a vacant space beside the curb when there seems to be but little room for them to maneuver in.

The natural inclination of an inexperienced driver trying to get his car alongside the curb between two other cars is to head his automobile right into the space and then to try by backing up and going ahead to get in close. He is very apt to become discouraged in the attempt and to either give it up and go elsewhere or to leave his car standing out two or three feet from where it should be.

The proper way to get a car into such a space is to drive right past the space a few feet and about two feet away from the car in front. Then the wheels should be sharply cut, so that the back of the car will point into the space. When the back wheels are a couple of feet from the curb, the front wheels should be turned in the opposite direction, thus bringing them in until the car is about parallel with the curb. The front wheels should then be turned toward the curb and the car driven slightly ahead. Before all the space ahead is used up, however, the front wheels should be turned out toward the street and the car driven ahead as far as is safe.

The wheels can then be again cut toward the curb and the car backed, but again before all the space in back is used up the front wheels should be turned the other way.

For those who have experienced difficulty in this maneuvering or who have trouble in turning their cars on a narrow road a little practice with these instructions in mind will prove quite enlightening.

A HOT ONE

"A flirt, am I?" exclaimed Mary Ann under notice to go. "Well, I know someone that flirts more than I do, and with less excuse." She shot a spiteful look at her mistress and added: "I'm better looking than you. More beautiful. How do I know? Your husband told me so."

"That will do," said her mistress frigidly.

"But I am not finished yet!" retorted Mary Ann. "I can give a better kiss than you! Want to know who told me that, ma'am?"

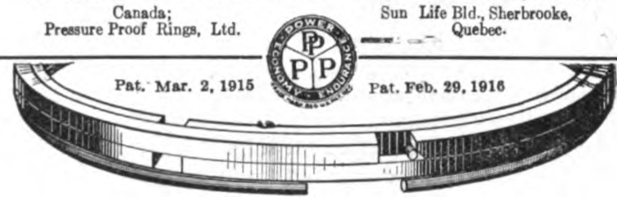
"If you mean to suggest that my husband—"

"No, it wasn't your husband this time," said Mary Ann. "It was your chauffeur."—The "Lightning Line."

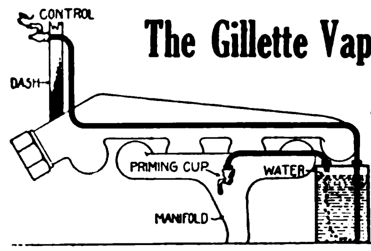
—use PRESSURE PROOF RINGS—
and permanently cure Carbon and Over Oiling

Pressure Proof Piston Rings form a perfect, permanent, three-sided seal that cannot be broken. Not an ounce of compression can be wasted. Your motor will have full power, consume less oil and fuel, will not smoke and will be absolutely free from carbon, always.

PRESSURE PROOF PISTON RING CO.,
107 MASSACHUSETTS AVE., BOSTON, MASS
Canada; Pressure Proof Rings, Ltd. Sun Life Bld., Sherbrooke, Quebec.



The Gillette Vaporizer and Primer



A reliable apparatus to prevent carbon and give more power by feeding moist air or vapor (not water) to the motor providing a rich supply of OXYGEN to the gas combustion.

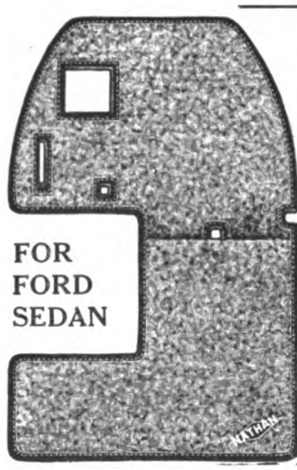
The Gillette Vaporizer consists of—

The Vaporizer Valve combined with Primer; a Copper Tank, quart size; a control petcock for dashboard; 5 ft. of 3/16 Copper Tubing; 4 Compression Couplings. **The price complete is only $8.00.**

The *Gillette Vaporizer* can easily be attached by anyone, a small hole to be drilled into the manifold with ⅛ thread for the vaporizing valve with primer and the same size hole into the dashboard to receive the control-petcock. Can be attached to any car.

Write today. You'll like it—or you get your money back.

E. O. WOLFF, Mfr. of Automobile Accessories, Gillette, N. J.



FOR FORD SEDAN

NATHAN
Carpet Mats
For Ford Cars

Made of especially constructed auto carpet. Edges substantially bound with fabric leather. Neutral gray color.

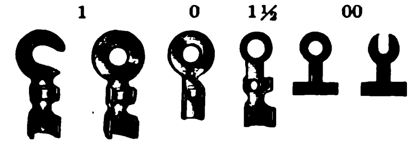
Dealers, Jobbers, Owners, write for complete catalogue. Liberal trade discounts.

A.D. 1481	Touring or Runabout	$3.35
A.D. 1483	Coupelet	4.00
A.D. 1482	Touring Tonneau	2.80
A.D. 1484	Sedan, complete	7.75

Nathan Novelty Mfg. Co.
55 Fifth Ave., Dept. A.D., New York

BIG PROFITS in SMALL WARES

Brass and Copper Terminals are in constant demand Keep your stock of Ideal Terminals complete and make the profits which would otherwise go to some other store.



No. 00	Spad Terminals—Open or Ring (specify)	per 1000	$4.00
No. 0	Small Primary Wire 5/32"	" "	4.00
No. 1	Open or Ring (specify) Regular Primary Wire 7/32"	" "	5.00
No. 1½	Long Neck Primary Wire 1/4"	" "	8.00
No. 2	Regular Magneto 5/16"	" "	9.00

Get Our Discounts to Dealers

Ideal Clamp Mfg. Co., 202 Bradford St., BROOKLYN, N. Y.

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New and Useful Automobile Accessories

The Glar-Stop

Every motorist has come to realize that the Motor Vehicle departments in the various states are unable to enforce the "non-glare" headlight laws. There are many cars being driven at night which cannot be passed in safety simply because their headlights are so glaring that the approaching drivers are blinded.

To obviate this trouble, the Sedgwick Sales Co. of 1409 Sedgwick Ave., New York City have manufactured a unique device called the Glar-Stop and the writer was given a demonstration of the utility of the device at the N. Y. Automobile Show. He can safely say that a car equipped with the Glar-Stop is immune to the most glaring lights.

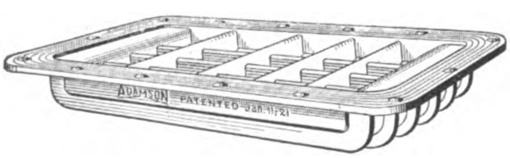
The Glar-Stop is a simple device which may be attached to the windshield, in front of the driver. It consists of a frame of polished nickel, carrying a center glass of either red, green, violet or amber color, as desired. At the lower end is an oblong plate of nickel.

When in use, at night, the Glar-Stop is swung down at one corner of the wind-shield, about even with the eyes of the driver. When meeting a car equipped with glaring headlights, the driver of a car can shield his eyes from the glare and thus see his own road ahead. The nickel frame extension or the colored glass may be used as desired.

While the device actually shields the eyes from glare, the translucent shield enables him to see the approaching car without the attendant glare.

Oil Cooler For Fords

A device which is readily bolted to the bottom of the engine crankcase of the Ford car in place of the present pressed steel inspection plate, is being manufactured by the Adamson Manufacturing Company, East Palestine, Ohio, and called the Adamson Oil Cooler.



The construction of this device is said to make a very considerable reduction in the temperature of the lubricating oil. The advantages of a product of this sort can easily be recognized and it will pay readers to write to this Company for a full description.

Uses of Asbestos in Garage and Repair Shop

The article by Mr. David Baxter, entitled "Shop Kinks for Welders," which appeared in the March issue of the Automobile Dealer and Repairer, and contained the following statement:

"Most welders have learned that asbestos is indispensable in the welding shop. It can be used in so many different ways that it is an almost absolute necessity. They have learned also that it is quite expensive because it is extremely fragile when hot or after being heated."

This statement prompts a few suggestions.

While it is true that pure asbestos has remarkable ability to withstand heat the flame of a welding torch is of such a character and temperature that it can destroy almost all materials when applied directly to them.

A great many of the asbestos papers and boards on the market are not suitable for use in connection with welding operations, as they are not usually made from pure asbestos but are manufactured in response to a large demand for an inexpensive heat-resisting material.

If welders would use asbestos wood where rigidity is required, and asbestos cloth where flexibility is a requisite, they would find that these products are satisfactory. Moreover these forms of asbestos are not "extremely fragile when hot or after being heated" except when the flame of the welding torch is directly upon them continuously for quite some time.

Asbestos wood one-eighth of an inch thick costs about twenty cents a square foot, and high-grade asbestos cloth woven from long spinning fibre comes to about sixty cents a square foot. These materials are much more economical in the long run than the lower priced asbestos papers and boards.

There are many other asbestos products which may be used advantageously by repair men not only on welding operations but in more ways than any one man knows. These materials are stocked in the sixty-four Johns-Manville branches throughout the United States—a list of which appears on most of the booklets of that company and in some of their advertisements

In case of emergency, there are roofing dealers everywhere who carry Johns-Manville Asbestos shingles. These come in very handy around any repair shop, and cost only a few cents. They are made of asbestos and Portland cement united under tremendous hydraulic pressure and come in square and hexagonal shapes one-quarter inch thick.

For welding operations, asbestos cloth gloves and aprons are not only a great protection but a help as well because their use enables welders to get closer to the work with entire safety. There are several kinds of asbestos gloves and mittens, some ventilated and some with wrist protecting gauntlets. Asbestos coats are made for completely protecting the upper part of the body, and there are also on the market asbestos aprons of the usual pattern and asbestos arm protectors which are about sixteen inches long.

The uses of asbestos materials around garages and repair shops are many and include sheet packings of which the brand known as "Service" is considered the best for all around automotive use—one of the reasons being that it contains a large percentage of asbestos which imparts to it ability to resist high temperatures and also prevents its deterioration with age.

Asbestos cord packings are used around water pump shafts, transmission shafts and in stuffing boxes requiring small round packings that will withstand severe service. For these uses, "Mogul" packing is unsurpassed, and its well-known durability is largely due to the high quality asbestos yarn used in its manufacture, as well as to the lubricant with which it is impregnated.

Last but by no means least is "Non-Burn Asbestos Brake Lining," of which enormous quantities are used throughout the world. This product is made of selected asbestos fibres from the Johns-Manville mines in Canada. It has just the qualities required namely: ability to withstand heat, and good frictional characteristics.

While all garage men know about the Non-Burn asbestos brake lining, it may be well to state in conclusion that this material is made in the woven type and also in what is known as the "folded and stitched compressed" type, each of which has its advantages. Both types are made in standard widths from one to four inches by quarter-inch steps and from four to six inches by half-inch steps; in thicknesses from one-eighth to five-sixteenths, and also three-eighths for the "folded and stitched compressed" type.

Schaap Piston Rings

Very unusual records are held by the Schaap Piston rings manufactured by The Schaap Company, 344 Cumberland St., Brooklyn, New York. Practically every racing driver equips his car with this brand and many Schaap Ring equipped cars have broken records.

It is claimed that the Schaap ring does not depend upon mechanical pressure to hold it against the cylinder but oil pumped to the back of the ring does this, and, because it is constant, holds it there perfectly. The manufacturers say that the circulation of oil keeps the piston and rings cooler and prevents carbon from being formed in the ring groove.

There are other features of these rings

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which should appeal to readers, and those interested may write to the manufacturers for full particulars.

Lox-On Dust Cap

The Lox-On Dust Cap, manufactured by the Automatic Safety Tire Valve Corporation is a very handy device which is being widely used and is standard equipment on the Collins tires. The dust cap prevents the air from a leaking valve leaving the tube and in principle follows the operation of the successful Lox-On chuck manufactured by the same concern.

When using this device it is not necessary to screw down the entire length of the valve stem anywhere from twenty-six to fifty-two complete turns, but it is only necessary to slip it over the valve stem as far as it will go and then give it a twist which locks it on.

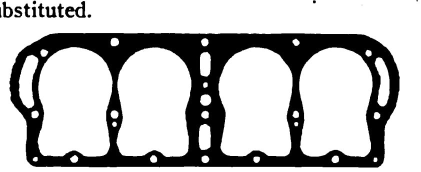
Full information regarding this device may be obtained by writing to the manufacturers, the Automatic Safety Tire Valve Corporation of 1753 Broadway, New York City.

¾ ACTUAL SIZE

Victor Mfg. & Gasket Co. Increases Line

The Victor Manufacturing & Gasket Company, which for the last few years has specialized entirely upon the production of Victor Copper-Asbestos Gaskets, is now putting on the market a complete line of shims. These will be made of both copper and brass and there will be a type for every motor and engine need. The Victor Company has had several years of experience in the manufacture of shims but the increased motor production during the war created such a heavy demand for Victor Gaskets that the capacity of the factory was taxed to the utmost and the making of shims was temporarily discontinued.

The Victor Company is also putting on the market a new fibre top cylinder head gasket for Fords. This new gasket is in every way identical with the standard Victor Copper-Asbestos Ford gasket No. 101 with the exception that in place of the top layer of copper a special non-absorbent, heating resisting fibre of great strength is substituted.



Patents on this gasket were obtained in 1917 and several hundred thousand were made and found to give absolute satisfaction in service. There are two types: Victor Number 101-A in which the outer edge is turned over making a closed gasket and 101-B with plain edges. The big advantage of this gasket is its lower cost which enables jobbers and dealers to meet the demand for a serviceable Ford gasket reasonable in price.

The Pierce Clutch Governor

The Pierce Governor Company of Anderson, Indiana, manufacturers of the well known Pierce Governor for truck and tractor engines, are now in production on a new governor designed to perform an entirely different function.

As the name indicates, the purpose of this governor is to regulate the action of the clutch. It is equally suitable for use on passenger cars, truck or tractors, and the manufacturers claim that the use of the Clutch Governor makes the clutch mechanism practically automatic in its action.

Even drivers of many years' experience are often careless about handling the clutch. The fact of the matter is, a clutch demands careful and intelligent handling. This is especially true after a clutch has had a few years of service and has a tendency to "grab."

The Pierce Clutch Governor is in reality a specially designed dash-pot, about two inches in diameter and six inches long. The base of the governor attaches to a bracket (fastened either to transmission case or frame of car) and has a pivoted action so that it can follow the movement of the clutch pedal. The top of the Clutch Governor connects to an extension on the bottom of the clutch pedal. Inside the governor is a fluid of special composition, on which even extreme changes of temperature produce practically no change in its fluidity.

As the clutch pedal is pressed down, the piston inside the cylinder body of the governor is raised without any resistance, since the fluid passes freely through the poppet valves in the piston head. When the pedal is released, the clutch spring compels the piston to travel downward. As this happens the valves in the piston head close and force the fluid through a by-pass, offering just enough resistance to the clutch spring so that the clutch engages gently.

A screw adjustment is provided so that the passage of the fluid can be regulated to suit each type of clutch. The cylinder walls have a series of pockets and the actual travel of the piston against resistance is only three-eighths of an inch —just before the clutch engages, allowing it to take hold without jerk or jar to the car's mechanism, and always just the same.

The Manufacturers claim that with the Clutch Governor on a car, the driver can do anything that he can do without the governor—except let the clutch "grab."

The installation of the Clutch Governor is a comparatively simple matter for any shop that can forge or machine a rough but substantial bracket for supporting the governor. No close work is required. The Pierce Governor Company, however, has perfected complete outfits for Dodge, Buick Studebaker, Reo, Kissel, Chevrolet and other popular makes of cars. These outfits include the bracket and all parts necessary to complete the governor installation and the entire job only requires a few minutes.

Bus and School Bodies

The McKay Carriage Co. of Grove City, Pa., are manufacturing bus and school bodies for any type of chassis from the Ford to the Packard. These bodies are giving universal satisfaction and are being widely used.

The bodies are constructed in sizes to hold from ten to fifty passengers.

Schrader Universal Tire Valve, Spare Parts and Accessory Kit

Motorists who value the mileage to be obtained from tires when properly looked after will welcome the announcement by A. Schrader's Son, Brooklyn, of the putting on the market of a small kit box which contains every accessory that has to go with a tire-valve and is designed to do away with tire trouble.

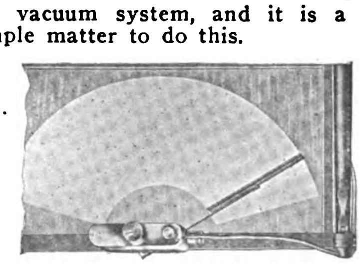
In addition to a box of Valve-Insides, the kit contains a set of Schrader Kwik-On-An-Off dust caps, a set of rim-nut bushings, five valve-caps a valve-repair tool, a pump connection which permits the testing of the tire inflation without disconnecting the pump from the tire, a wrench for the tightening of the hexagon nuts at the base of the valve-stem and a Schrader Universal Tire Pressure Gauge.

The Kit which is described as a Schrader Universal Tire-Valve, Spare Parts and Accessory Kit, is covered in imitation leather and makes a very acceptable gift for presentation to a motorist.

Everyready Automatic Windshield Cleaner

The Eveready Automatic Windshield Cleaner is a very compact, efficient device for keeping the windshield clean so that the operator of the car is enabled to drive safely during a snowstorm, rainstorm or any sort of weather in which the windshield becomes misty or clouded.

It operates automatically, and it is only necessary to turn the button to start the cleaner going. Connections can be made to the intake manifold or the vacuum system, and it is a very simple matter to do this.



Motorists now realize that it is almost imperative to have some sort of a windshield cleaner attached to their cars, and in buying one, they would do well to investigate the Eveready automatic.

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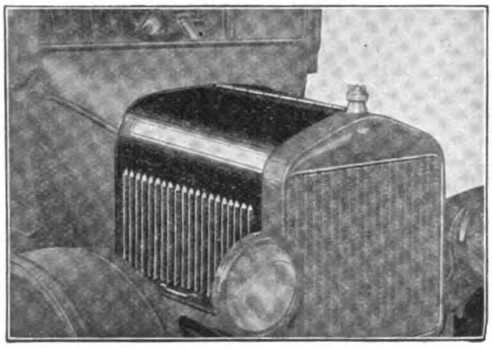
The A. B. & B. Ford Hood

Those of our readers who own Ford cars of the 1917 or later model will surely be interested in the Ford Hood which is being manufactured by the A. B. & B. Sheet Metal Works of Fond Du Lac Avenue, Milwaukee, Wisconsin.

This hood is made from heavy gauge metal and has an excellent finish made by the application of a two-coat baked



enamel. A feature of the hood is the center hinge construction. This hinge is provided with a water-shed arrangement which prevents the rain from beating in or dripping upon the spark plugs and causing trouble.

A Gruelling Test Run for Shock Absorbers

The Auto Specialties Mfg. Company, St. Joseph, Michigan, is announcing the results of a test run of 10,532 miles made by a Ford touring car equipped with a set of their Drednaut Shock Absorbers. This run was made to give the shock absorbers, which have a number of exclusive features in design and construction, a thorough tryout before entering into production. The test has a peculiar interest in that it is the first one undertaken to study the performance of an accessory under such a wide range of conditions.

Leaving St. Joseph on March 7th and returning May 21st, during the rainy season, the Ford traveled in a southerly direction to Florida, stopping at Louisville, Chattanooga, Savannah and Tampa en route, and at Montgomery, Jackson, Vicksburg, San Antonio, El Paso, Phoenix and Los Angeles preparatory to the northern leg of the trip, which included Portland, Spokane and then back down through Butte, Minneapolis, Milwaukee, Chicago and back to St. Joseph.

Detours were not made; impassable roads, sand, rocks, alkali, clay and ordinary "no bottom" mud roads were encountered—sought out rather than avoided—and examination of the Shock Absorbers at the end of the trip revealed no defects, nor was there any expense for repairs or replacements to them during the trip.

Dreadnaut Shock Absorbers are a combination rebound check and shock absorber. The car is suspended on four Vanadium Steel springs of unusually good grade. High quality malleable castings are used as a basis and drop forged parts are substituted where excessive wear is found. Being manufacturers of standard equipment for the industry, they are familiar with design and materials and have brought out what they claim is a superior shock absorber for use on every type and model of Ford, and are working on a special Drednaut for Ford truck use.

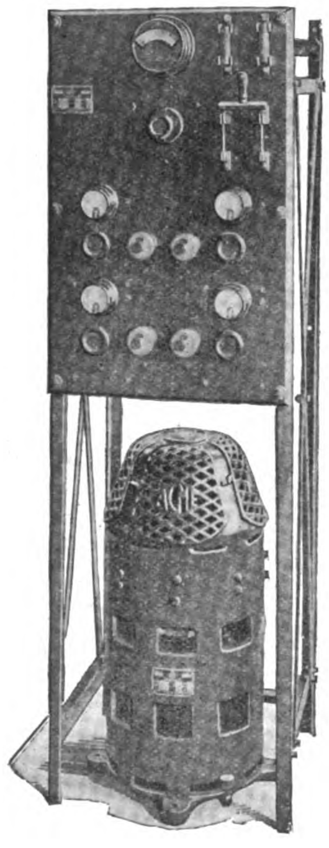
Acme Chargers

The Acme Electric & Manufacturing Co., Cleveland, Ohio., manufacturers of various battery charging apparatus and motor generators, recently introduced a new charger to charge ignition, lighting and starting batteries.

The charger is known as the "Acme." This equipment is built in sizes ranging from 3/4 K. W. to 5 K. W. on the D. C. end operating on 110, 220, 440, 550 volts, 1, 2, or 3 phase on 60 cycles.

The Acme charger takes up a little more than a square foot of floor space. Its motor is of liberal capacity and built for heavy service. The generator is designed with the latest features of engineering practice, the shaft is of one solid piece of extra heavy structure rotating on oversize ball bearings. The dynamically balanced armature and rotar are mounted on one shaft. The commutator has a large radiating surface and maintains a low operating temperature. Cool air is afforded by a Sirocco type fan which thoroughly ventilates the motor and generator by drawing cool air through the windings.

As to control boards several types are being built to accommodate the needs of



the ultimate consumer. The panel shown in cut is the four circuit type, each circuit has an independent regulator, with independent ammeter inserted directly in circuit, also a snap switch by putting this switch in different positions one can read the voltage of the individual circuits. On the panel is a field rheostat, voltmeter, D. C. and A. C. switch.

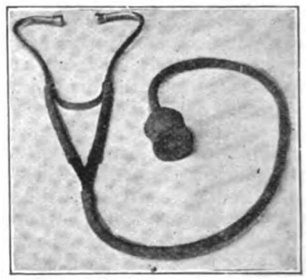
L. E. German Appointed Sales Manager

Announcement has been made by Edward Verlinden, President of the Durant Motor Co., of Michigan, of the appointment of L. E. German as Sales Manager of that concern.

The Knok Tector

Of very recent invention is the Knok Tector an instrument devised principally for use in locating trouble in automobile motors or bearings or gears or anywhere in the car and also adapted to many other uses.

The idea of using a Knok Tector is to ascertain accurately and with certainty the origin of sounds which are made by some moving defective part of mechanism or it may be an improperly adjusted or wornout part.



The Knok Tector looks very much like a doctor's stethescope and is used in very much the same way. The binaural is placed to the head so as to permit the ear tips to enter the ears. When properly placed the operator will be able to hear only the sounds transmitted directly through the tubes from the Tector.

The Tector is fashioned so that the knock or grind of the trouble giving part is heard distinctly and the vibrations and resonance from surrounding parts do not interfere.

To determine where the defect is the Tector is pressed against the object to be tested, moving the Tector until the spot is found where the objectionable noise is most intense, this will be found to be the centre of the trouble.

As a time saver and a nerve saver it is without rival for the mechanic's use.

With a Knok Tector such trouble as piston slaps or knocks, loose wrist pins loose bearings, noisy gears, squeaks, noisy tappets, rattles, etc., may be located without going through the long process of tearing down and guessing.

It is made by the E. R. Benson Mfg. Co., of Portland, Maine. Mail orders receive prompt attention and samples can be sent through the mail safely.

Agents are wanted to handle Knok Tector in all parts of the country.

Peerless Speed Band Liquid

The Columbia Varnish Co., of Columbus Ohio, claim that their newest product, Peerless Speed Band Liquid will stop the grabbing, jerking, jarring and shaking of Ford cars, which is unnatural.

This company claims that after careful study, it was found that this was all caused by the speed bands which had become glazed through their use on the metal drums and the carbon in burnt motor oil.

The liquid which they manufacture is to be applied to the bands, without removing them from the car, and it is said to affect the qualities of the bands in such a way that they become as good as a new set.

Further information in regard to this liquid may be obtained by writing to the manufacturers.

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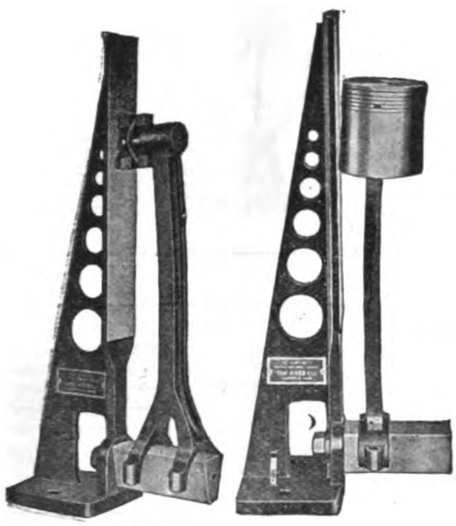
Fort Hill Aligning Gauge

The "Fort Hill" piston and connecting rod aligning gauge, manufactured by the Dyer Company of Cambridge, Mass., is finding great favor in garages and service stations. The makers claim that the gauge is a necessity for cylinder grinding and reboring concerns, as well as service stations and repair shops, and that their extensive experience in operating a large regrinding department has convinced them that 75 per cent of the piston trou-



A—Straight edge of V block vertical, showing bend in rod. B—Dectecting either bent rod or imperfect piston.

ble connected with reassembling motors and installing pistons is due to bent or twisted rods.

Among the distinctive features claimed for the "Fort Hill" are: It is universal with one arbor, simple and complete for first cost; its micrometer accuracy is guaranteed, the machine being made by the same careful methods as is a micrometer; it has only one moving part, assuring lasting accuracy; and it can be quickly checked for accuracy by the user. It can be used with positive results by the average mechanic.

The Nathan Comfy-Crib

Although the older members usually enjoy a spin in the automobile, a hot day the baby does not relish being tossed around from lap to lap, nor is it possible to give the baby his accustomed nap in comfort, in the automobile without suitable facilities.

The Nathan Novelty Mfg. Co., of 55 Fifth Ave., N. Y. City, is making a comfy-crib which is well worth investigating by every automobile owner, who at the same time is the proud possessor of an infant. The Comfy-Crib is made of dark grey auto cloth and hung upon a frame of steel. The frame is so constructed that the cloth may be taken off, very easily, for washing.

The Crib is suspended from spiral springs and hung upon light, but strong chains. The whole combination is such that the crib rides with a maximum of comfort while hung inside the car, from the top irons. The crib can be hung in the house or on the veranda and is not limited to use in the car. This makes the device an all-around proposition which is a good investment.

The Two Spark-Double Plug

The Carbo-Gas Company of Toledo, Ohio, are manuafcturing a spark plug for which they make some wonderful claims. The plug is practically two plugs in one, a large outer plug and a smaller inner plug. This plug has five points of firing and is so arranged that should one or more points become "shorted" at least one of the others will carry the spark and fire the mixture.

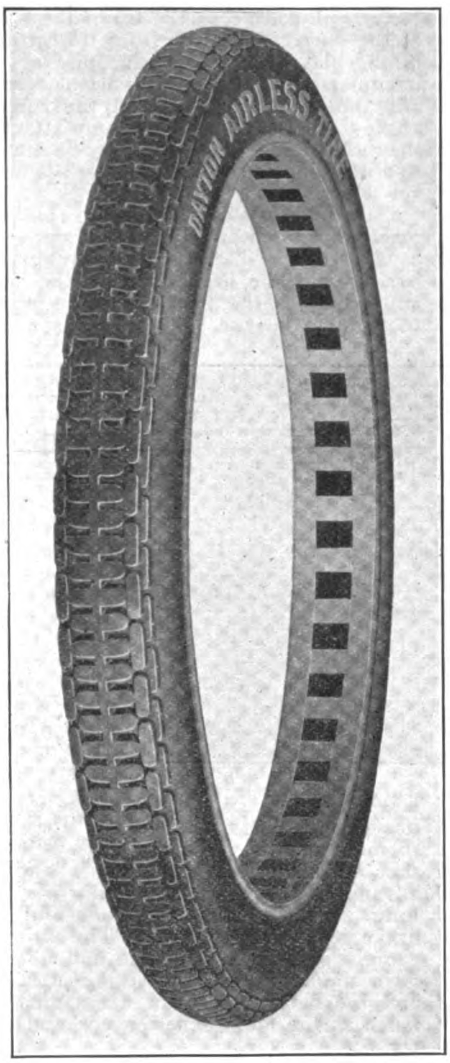
The plug carries a form of electrical condenser in it which stores the current and thus raises the voltage until it will jump through oil or carbon deposits.

A feature of the plug is its two separate porcelain insulators, the inner one for insulating and the outer one for protection.

Dayton Airless Tires

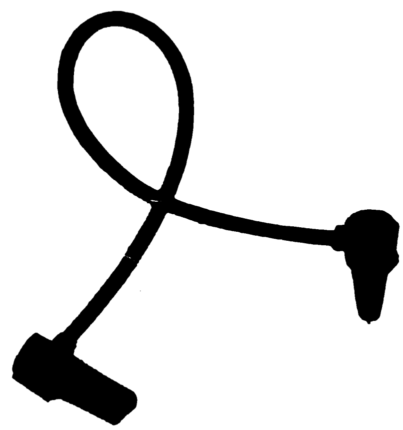
The Dayton Airless tire is built with piers of rubber set about an inch apart and vulcanized as parts of the tire itself. These piers take the place of an inner tube. They were formerly made of one kind of stock, but now they are made of what is known as two-stock compound.

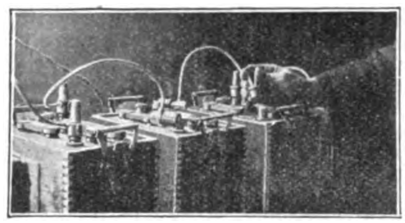
The lower half, or base of the pier, is made of a compound that adds strength and endurance to the side walls and is of sufficient density to prevent rim cutting. The upper, or outside half of the pier is made of much more resilient, springy, shock-absorbing rubber, adding greatly to the easy-riding qualities of the tire and insuring flexibility.



Rose Everlasting Battery Clip

The Frank Rose Mfg. Co., of Hastings, Nebraska, manufacturers of Rose Tire Pumps and Rose Grease Guns, are now placing on the market an entirely new principle of Battery Connector to be used for connecting batteries on the charging bench. The new clip will be known as the Rose Everlasting Battery Clip. The clip is made of a special compounded





metal which is said to resist corrosion and will not be destroyed by the action of the acid. The cable heavily insulated is cast into the body of the clip.

The clip is so designed that it is universal in use—fitting the different types of batteries now on the market. By pinching one end between the thumb and fingers the clip telescopes the post and when the pressure is released makes a firm connection. By compressing the small or pointed end it can be slipped into the female type of post and the tension released. It is also claimed to fit cables and flat bars giving a perfect connection under all conditions.

Some of the advantages claimed by the manufacturers are: The metal of which the clip is made resists corrosion and will not be destroyed by the action of the acid, the heavy insulated cable saves the current lost in transmission over small exposed cables or wire and the price is very low. Jobbers and dealers are requested to ask for information and prices.

Titan Battery for Fords

A battery which is designed to give a high terminal voltage and maximum power output in winter as well as summer is called the Titan Battery for Ford cars and is manufactured by the General Lead Batteries Co., Chapel St. and Lister Ave., Newark, N. J.

There are many features of construction on this battery which make it worthy of attention and it would undoubtedly pay readers to investigate the merits of the device.

The General Lead Batteries Co. has published a folder on this Titan Battery which is unusually interesting.

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New Machine for Operating Cutting Torch

A new machine for operating the oxy-acetylene cutting torch was given its maiden test in industrial service recently at the government proving grounds, Sandy Hook, where it was put through its paces in the presence of engineers of the Development Department of the Linde Air Products Company and a group of practical cutting blowpipe operators from the Oxweld Acetylene Company's Newark welding shop. The latter company some time previously had entered into a contract to reduce 4,000 tons of punctured armor plate to charging box sizes, and the new machine was developed with the coöperation of Linde engineers in an effort to effect economies in the oxy-acetylene process involved. The test was an unusual one in every way and a revelation to the engineers and operators alike.

The particular problem involved in the Sandy Hook job was to devise, if possible, a semi-automatic mechanical means of cutting irregular surfaces. The conditions confronting the Oxweld cutters were such that no straight-line cutting machine then on the market was adapted to the work. Accordingly, Linde engineers went to Sandy Hook at the invitation of the Oxweld Company, examined the physical features to be overcome and began work on the problem at once. It was not a commonplace situation. The armor plate was badly warped by the impact of the shells which had pierced it in target practice, and the punctures (six in each plate) were mushroomed and ragged. Each of the plates (3 inches thick by about 9 feet x 13 feet) weighed between seven and eight ons.

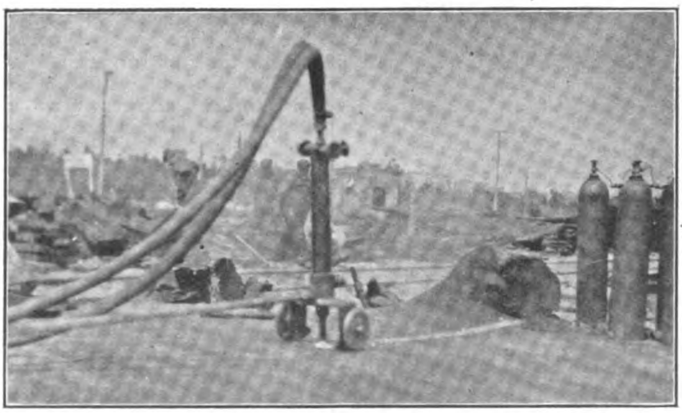
Besides irregularity of surfaces, another difficulty loomed large in the metallurgical composition of the metal, which contained high percentages of nickel and chrome. This kind of steel yields a heavy and viscous slag that does not flow freely from the kerf in blowpipe cutting. This not only retards the cutting speed but necessitates higher oxygen pressures than are required in cutting ordinary steel of the same thickness.

The inventor of the machine describes it in the following rather technical terms:

The power for operating the machine is furnished by a General Phonograph Company spring motor. On the turntable spindle is a worm. In mesh with the worm is a 72-tooth worm wheel on a horizontal shaft running in two bearings. On the outboard end of this horizontal shaft is fastened a knurled-groove pulley. Above is another and larger knurled-groove pulley which is held down by spring tension. Through these two rollers pass jointed knurled pull-rods of which the out end is attached to a torch carriage. A lever is attached so as to pivot on the idler roller shaft and, when raised to a vertical position, applies a brake to the lower driving shaft, at the same time separating the two rollers, giving freedom to the knurled pull-rod.

The usual phonograph speed control is used. A change is made in the governor weights of the motor to run faster. This, together with the large gear reduction provided, gives a greater towing power to the pull-rod. An Oxweld C-7 machine cutting torch is mounted on a two-wheel cart having wheels 3 inches in diameter. The wheels are made of cast iron and the bearings and wheels are protected from sparks by metal shields. Runners are provided on each side set close to and inside of the wheels. The runners are three inches in length and are mounted to clear the plate ⅛ of an inch. Their function is to prevent the torch carriage from falling off the plate at the start and finish of the cut. The combination of the two-wheeled cart with swivel connection to the pull-rod keeps the tip of the torch at the correct distance from the surface of the plate at all times in spite of the irregular surfaces of the warped armor, and the cut is thus kept at the correct angle to the plate. A "C" clamp attaches the motor to the plate and may be moved to a new line of cut by releasing the hand set-screw.

It would be interesting to pit the machine against an expert hand cutter in a test of speed and gas consumption, but it would be hardly fair to the hand cutter because the machine has no nerves to yield to fatigue. Its greater speed is largely due to its steadiness, as is also its saving in gas consumption. It is said to make a clean, straight kerf, which is the technically economical cut, and its advance is as regular as clockwork. So long as its spring is wound and the brake released it will run. The ultimate promise of the new device undoubtedly is in the fact that with it the unskilled and inexpert cutter can accomplish as much as the most experienced hand cutter.

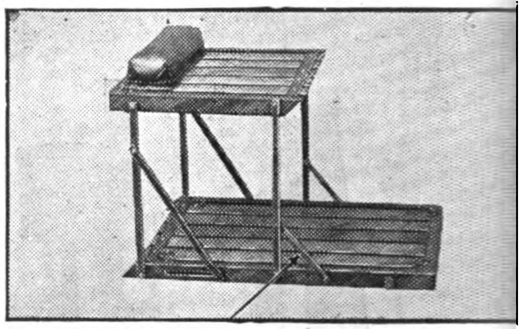


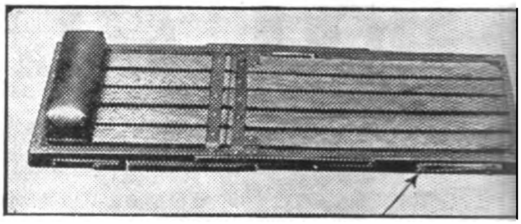
The engineering difficulties, however, were quickly overcome and a completed test machine was on the job within a week after the Oxweld's hand cutters started work, or virtually at the outset, so that any economies resulting from machine cutting would effect a material saving on the contract. In the meanwhile it is anticipated that the new applications will be developed, as machine cutting of irregular surfaces has been a long felt want in wrecking operations.

The Duo Creeper Plus Seat

The Walker & Barkman Mfg. Co., of Hartford, Conn., are making a device which should interest every car owner and repairman. This device is a combination creeper and seat and is illustrated herewith.

When used as a creeper, the seat lies flat taking up only 1½ inches in height. It is made of wood slats mounted in a





channel iron frame and is fitted with a leather-upholstered, cushion, head support.

The whole device folds into a very small space and may be hung upon the garage wall. The outside frame dimensions are 36 by 15 inches.

McCord Installs New Equipment

The McCord Manufacturing Company, of Detroit, Mich., makers of automobile radiators have installed an electrically heated japanning oven in their plant which possesses several features of general interest.

The oven, which was built by Young Bros. of Detroit, is of the continuous conveyor type, and is double decked, having two compartments, one over the other. The work after being dipped is carried on a conveyor through the lower compartment, then back and through the upper, the exit of which, is just above the entrance to the first. Both compartments have the same dimensions, 10 ft. 4 in. wide by 5 ft. 10 in. high, by 60 ft. 10 in. long. It is equipped with General Electric Co. heaters, and automatic control, the total connected load being 324 KW at 220 volts, three phase, 60 cycle. The baking capacity is 3000 lbs. of radiator shells, the time being 45 minutes from entrance to exit.

The heat is divided into three zones, regulated by automatic control panels located just above the entrance to the ovens. The lower compartment is equipped with comparatively few heaters, which are concentrated at the rear end. This gives a preheating zone in the forward end through which the work passes, before being subjected to the maximum heat of the compartment, 250° F. The work is then carried to the upper chamber, which is equipped with heating units for its whole length. The temperature in this compartment is 450° F. which is required to complete the bake.

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Classified Advertisements

Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance.

No advertisement will be inserted for less than one dollar, however small.

Remittances may be made in postage stamps or in any convenient way.

Special rate of 40 cents per non-pareil line for each insertion if taken for 12 consecutive titmes.

Address MOTOR VEHICLE PUBLISHING CO., 71-73 Murray Street, New York

Salesmen Wanted

SALESMEN WANTED—Well known chain manufacturer wants good, live representative in every section to handle their fast selling Automobile Accessories as a side line on a commission basis. In first letter give age, experience, present connections, territory covered and reference. C % Automobile Dealer & Repairer, Box No. 654 City Hall Station, N. Y. City.

DISTRIBUTORS—For exclusive territories wanted for the Gillette Vaporizer and Primer, a great improvement on any make car or truck. An easy selling Article. E. O. WOLFF MANUFACTURER, Gillette, N. J.

Opportunity

HOW TO MAKE MONEY, repairing Automobiles by modern methods with Labor Saving Tools, booklet free. Keystone Garage Equipment Co., 98 Park Place, New York, N. Y.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Want to Hear From

WANT to hear from owner having automobile or other business for sale. Give cash price and particulars. John J. Black, 223rd, St., Chippewa Falls, Wis.

Ware Automatic Valve Adjuster

The Ware Automatic Valve Adjuster and Silencer is said to permanently silence the noisiest valve in the head motor. The common practice is to set the valve push rods up to about ten to fifteen thousands and let it go at that. This takes care of expansion and contraction and gives assurance of valve closing clearance. But it makes a very noisy motor. Such adjustments are rarely accurate enough to be fully efficient.

The Ware Automatic Valve Adjuster and Silencer is said to make it possible to make a snug, firm adjustment, positive in action but flexible enough under heat and high motor speeds to give perfect, noiseless valve action. The device is attached by removing 1-1/8 inches from the push rod, preferable at top. A spring steel washer between the two units of the Ware Valve Adjuster keeps the tappet snug against the valve stem at all times. The eccentric mechanism adapts itself to changes in expansion or contraction of metal and serves to at all times keep the tension on the valve stem snug enough to eliminate noise but not firm enough to interfere with efficient valve spring operation.

The silencers can be installed and adjusted by any competent mechanic in a few hours. A single adjustment is good for 10,000 to 20,000 miles.

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We have all of the most recent available motor vehicle registrations in every state—can promptly furnish complete states or individual counties. Send for our free booklet of statistics and prices.

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DON'T BE MISLED. But buy Massachusetts Motor Vehicle Registrations direct from the original publishers. Whole State or by Counties, Cities and Towns. 1921 lists. Auto List Publishing Co., 138 Pearl St., Boston, Mass.

Insyde Tyres

AGENTS—$8 a day taking orders for Insyde Tyres. Positively prevent punctures and blowouts. Guaranteed double tire mileage. Old worn out casings will give 3 to 5 thousand miles more service. No tools needed. Just slip inside casing before replacing tube. Will not heat or pinch. Katz made over $500 first month. Biggest thing on the market. Low priced. Write for territory. American Accessories Co., B-1011, Cincinnati, Ohio.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., 384-6 East 133d St., New York City.

HAVE crew of 5 men covering Maryland, Virginia, District of Columbia. Want accessories, or specialty, for territory. T. J. Mehlman, Continental Trust Bldg., Washington, D. C.

Garage Printing

GARAGE PRINTING—Time cards—do not pay high prices for repair tickets. Wet print them in large quantities and sell at lowest prices. 500—$4. 1000—$6. Cash enclosed or C. O. D. J. T. Losh, Special Garage Printing, 270 North Street, Harrisburg, Pa.

New Battery Acid Pump

The Leader Battery Equipment Co., (newly incorporated) of 324 Title Guaranty Bldg., St. Louis, Mo., is putting on the market a new battery acid pump. Announcement is being made to the automobile trade, jobbers, garage men, battery repair men, and battery service stations on the development of this Universal Battery Acid Pump.

This pump is designed so that it will fit from sixty to one hundred per cent of the carboys on the market. The manufacturers claim that this pump automatically justifies its air control, that the flow of the pump may be stopped instantly, that it is easily adjusted to any carboy up to three feet in depth, and that the outlet of the pump consists of hard rubber tubing standing a specific gravity acid up to 1720.

There is a very large market for a device of this nature, and we should advise our readers to write to the manufacturers to obtain full data in regard to it.

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Send us your Old Fly Wheel and we will quickly fit it with a Steel Gear Ring—Better than Cast Iron Gears. Our Prices Will Interest You.

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PROTECT your rights. Write for "Record of Invention" which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 612-E Columbian Building, Washington, D. C.

PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PATENTS PROCURED AND TRADEMARKS REGISTERED—Eighteen years' experience. Instructions and Terms on request. Robb, Robb and Hill, Attorneys at Law, 888 McLachlen Bldg., Washington, D. C. 1340 Hanna Bldg., Cleveland, Ohio.

Special Sale

"Special Sale" on all kinds of tires and tubes. New and Double Tread Tires guaranteed. Write for prices stating size. I. Jaffess, 1319 Fifth Ave., Now York City.

Bayley's Automatic Spark Plug Terminal (B. A. T.)

For Automobiles—Motorcycles—Motorboats—Aeroplanes

Instantly connected—instantly disconnected. "The Button does it!" Forms a rigid contact. The Spring locks it! Attached by hand—no tools needed.

4 B. A. T. Terminals for $1.50

B. A. T. Terminal Co.

105 Vanderveer St. Brooklyn, N. Y.

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Vellumoid Sheet Packing

Vellumoid Sheet Packing is not a new product, for Vellumoid gaskets have been used for years by a great many of the leading manufacturers of cars, trucks and tractors. It is now being used widely by repair garages for gasket work on every type of connection except the Cylinder Head and Exhaust.

The advantages of Vellumoid as an all around gasket material are many. It is made especially for automobile gasket work and is said to be proof against oil, gasoline and water. It is the only type of packing that oils will not deteriorate.

It also has splendid compressibility, taking care of all roughness in the flanges.

Its toughness is particularly pleasing to the garage mechanic for it is claimed that a Vellumoid gasket will not tear nor pull apart when being put into place.

Shellac is not necessary and this eliminates a good deal of flange scraping that is never easy nor pleasant.

The price is low, so low that the difference in cost between a Vellumoid gasket and a paper gasket is infinitesimal as compared with the cost of any repair job.

It is possible to obtain Vellumoid gaskets ready cut for the crank-cases, gear covers, etc., on the leading makes of cars, but for general repair work the sheet form is preferred. The 1/32 inch thickness is sold in 36-inch widths, and in rolls or sheets to suit the individual garage.

New United Motors Sales Help

The recent appearance of an attractive card in garages and service stations emphasizes a point which motorists are quick to appreciate.

This card carries a picture of Venus-de-Milo. It calls attention to the fact that "There is only one genuine Venus-de-Milo," despite the fact that it has been copied many times.

The card then urges the use of genuine Delco, Kaxon and Remy parts which are made and guaranteed by the makers of the original equipments and which are distributed through United Motors Service, Inc., whose genral offices are in Detroit.

The use of genuine parts is a protection both for the repairman and motorist. It is an indication of genuine serv-

Case of "Alemite" vs. "Rimtco" Settled

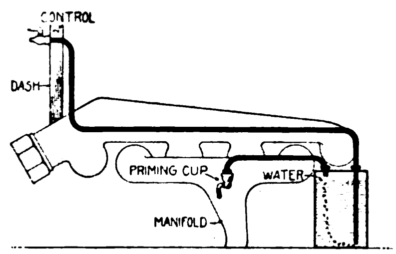
The difference over the patent rights involved between the Bassick Manufacturing Company, of Chicago, manufacturer of the Alemite System of lubrication and the Rhode Island Machine and Tool Co., of Woonsocket, Rhode Island, manufacturer of the "Rimtco" High Pressure System of lubrication, has been settled to the satisfaction of both parties concerned.

The "Rimtco" gun will be manufactured, as heretofore, by the Rhode Island Company, but under an agreement with the Bassick Company which gives the former full rights to manufacture and sell the "Rimtco" pressure grease gun. The Rhode Island Machine and Tool Co. will conduct an advertising campaign in newspapers and automobile trade papers, advertising the "Rimtco" gun.

The Gillette Vaporizer and Primer

E. O. Wolff of Gillette, New Jersey, is putting on the market a vaporizer and primer which is of unique construction and embodies one feature which makes it entirely distinctive.

The device consists of a water tank a dish control, the special priming head and the necessary lengths of copper tube. By the Gillette system only water vapor is admitted to the manifold. This is accomplished by drawing the air from



the top of the tank. A pet-cock on the dash controls the amount of air entering the tank and indirectly that which enters the engine.

The special priming head, which is distinctive, carries a priming cup and is screwed into the intake manifold. The raw fuel, when used for priming is poured into this priming cup and thence passes into the priming head.

The end of the priming head is cut, longitudinally by a number of slots and these slots are so placed that they are slightly above the priming supply tube. By this construction the raw fuel remains in the priming head until the engine is cranked when it is drawn upward, in a spray, in the same way as a carbureted mixture. With this design there is no chance for the raw fuel to run down the manifold and flood the carburetor.

The priming head also serves to spray the water vapor into the manifold. Water in a fine spray or vapor, tends to reduce or prevent the formation of carbon and make for a stronger, cooler and "snappier" engine.

Roll-A-Car

After two years of experimenting, testing and developing, the Walker Mfg. Co., of Racine, Wis., has perfected Roll-A-Car, a husky garage jack which is receiving very favorable comment from users.

A handy finger lever on the handle controls the entire functioning of the jack, and the leverages have been worked out to give a quick lift with short strokes.

With Roll-A-Car in position under a car a touch of the toe on the trip lever is said to instantly raise the rack bar into contact with the axle. Then a few short, easy strokes of the handle and the load is up, ready to be rolled into a parking place or to any other part of the shop. Six strokes of the handle raise the load six inches. Only by reversing the lever and pumping down can the load be lowered, so there is no danger of accident from bumping against the lever on the jack handle.

The manufacturers will gladly forward Roll-A-Car literature on request.

Charlie Hendy Leaves Ford

It is announced that Charles Hendy. Jr., "White Paint" Hendy to a host of friends and acquaintances in the auto trade, has withdrawn from the Ford Motor Co., to become associated with the Simplex Corporation, of 2214 So. Michigan Avenue, Chicago, manufacturers of Simplex Theftproof Auto Locks. Mr. Hendy acquires a stock interest and becomes Vice President and General Manager.

He has been connected with the Ford interests for 14 years. Before coming to Chicago two years ago as manager of the Chicago plant, he was for many years manager of the large Ford Motor Co. plant at Denver, one of the most important in the country.

Akron Rubbermold Vulcanizer

The Akron Rubber Mold & Machine Company of Akron, Ohio, build a complete line of Vulcanizer Equipment for Tire Repair use, including pneumatic truck tire cord molds, including giant pneumatic truck tire cord molds, including 6, 7, 8, 9 and 10 inch tires in both flat and round tread.

One of the very popular molds this year is the Improved Type A, which has been designed to accommodate cord tires as well as fabric tires. This is a three cavity outfit, with self-contained steam boiler, tube plate and inside patch vulcanizer attachment.

Type F equipment is also a very good seller in localities where giant truck tires are not in extensive use, as it is designed to accommodate fabric tires only. Type F is considered by The Akron Rubber Mold & Machine Co. as one of their best values and is a two cavity outfit with self-contained steam boiler, tube plate and inside patch vulcanizer attachment.

Another equipment of this Company, which is in much demand, is the improved Type E Cavity Retreading Vulcanizer. This model will accommodate all makes of tires from three inch to five inch cord and fabric tires. It is a self-contained outfit.

The March Distributor

The purpose of the manufacturers of the March Distributor is to provide a really high grade, dependable timing and firing device that will be for the Ford what the most perfect electrical systems are for the highest priced cars. The March Distributor is installed in the place of the ordinary Ford timer and in the same manner.

There are no current-carrying rollers to jump or miss, no wipe contact to become foul or cause mis-timing, no race to become rough. There is very slight motion in the moving parts and electric contact is made by the direct make-and-break system.

The entire distributor is very strongly and finely made and the manufacturers guarantee it for the life of the car. They claim that the March Distributor will for all time eliminate timer troubles.

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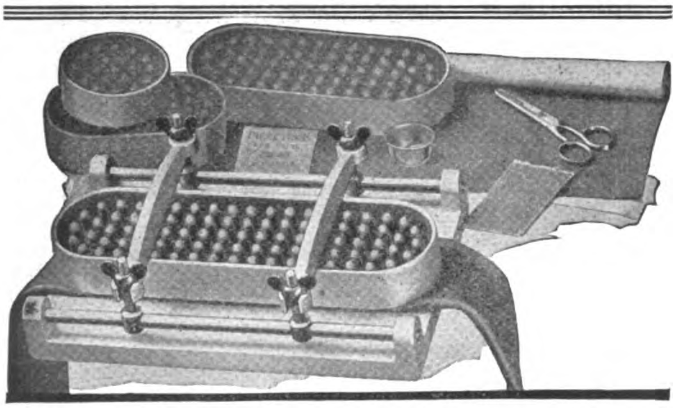

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TOOL AND MACHINERY NUMBER

Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 71-73 Murray Street-New York City

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Vol. 32. No. 2 OCTOBER, 1921 Monthly $1.50 per Year Single Copy 15 Cents

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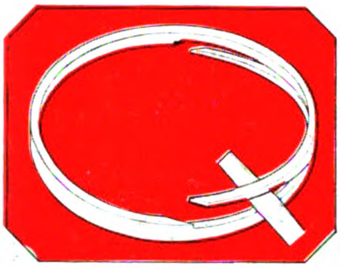

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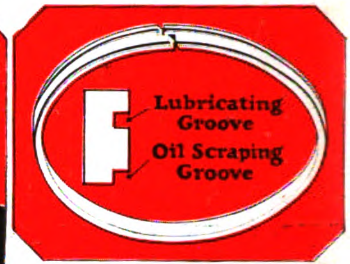

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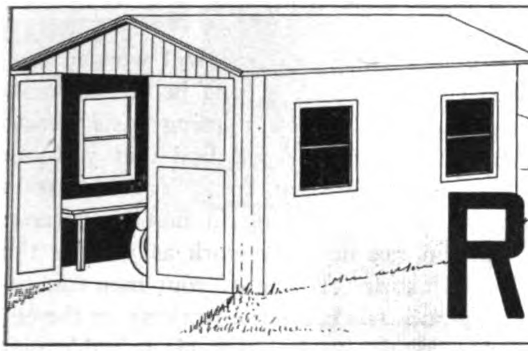

OUR OWN REPAIR SHOP

THERE are so many things to be said in this first article for this month that I hardly know where to start. Usually, or at least during the past year, you have rather expected to find a humorous article at the beginning of the magazine. Some of my best friends, (and I know they must be my best ones because they are the only ones who praise my work), have privately informed me that my humor is distinctive. Fortunately they are my friends and as such have declined to discuss the matter further. Others among my various acquaintances, and who are not quite so diplomatic, have admitted the quaintness of my first articles, but have admitted that much of the humor is recognizable because of its painful effort.

But at any rate the ability to joke about a bunch of tools, or an automobile other than a flivver, is a gift and since I cannot believe my sympathetic friends or trust the opinions of my enemies, I fear that I shall go through life without ever knowing whether my attempts at humor are really funny or merely laughable.

During the past few days I have had so much trouble with the car which I drive that nothing is humorous just now except the idea that perhaps some of my creditors expect prompt payment. And for this reason I am restraining my frivolity and really writing something which I hope is instructive rather than merely amusing.

* * * * *

For a number of months I have been collecting data for this "Tool and Machinery" number and though it may be comparatively easy to compile an ordinary issue, a "special," such as this, requires considerable study. All of you readers are of a necessity interested in automobile repairing. It matters not whether you operate a large service station or merely "tinker" with your automobile in your spare moments, the question of proper tool equipment is vital. And as you turn this and the following pages of this number you will find that this issue is devoted especially to tool equipment.

Although as far as you are concerned you will receive but one "Tool and Machinery" number out of every twelve, with us the matter of tool and machinery equipment is even more vital than with you. Not only must we know about equipment but we must know what can be done with machinery and with what machines or tools the various parts of automobiles can be repaired.

And so it happens that we are announcing in this, our first article, something which we have undertaken and which we hope will work out beneficially for all of our faithful readers. After much consideration we have decided to install a complete set of machinery in a laboratory. In our own machine shop we will develop ideas and pass them along to the readers. We will be in a position to speak with absolute authority and therefore will be in the "practical" rather than the "theoretical" class.

In introducing our shop to our readers we want to make one thing clear, we do not claim that it is complete at the present time. As time passes it is our purpose to add to our equipment and with each addition we know that our magazine will be benefited.

Those of our readers who are interested in tools and machinery will do well to follow the series of articles devoted to the equipment in our mechanical department. Bear in mind that from the beginning to the end we will base the articles upon theory and build them upon practical experience. We will not tell you what we *think* might happen or how we *judge* an operation *should* turn out; our articles will be in the nature of reports of actual mechanical operations, correct both theoretically and practically.

The installation of the machinery presented the first problem and since it is a vital one it will be discussed at some length. The construction of the shop itself, or the adaptation of the shop already built to the equipment, is just as important and deserves earnest thought. In presenting the lay-out of our shop to you we do so with the

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statement that the location of every window and the placing of every machine has been carefully considered.

For a single-man shop, or a small shop in which but one machine of each type is needed, the dimensions may be limited to a floor area measuring 25 by 30 feet. We would not recommend a shop of less than 30 feet in length, but if the width is at least 15 feet it will be sufficient. We consider the 25 by 30 foot dimensions as being nearly ideal for a small shop.

The location of the windows and doors will be taken up after the installation has been discussed. By referring to the plan given herewith it will be noted that the general arrangement of the machinery and benches is in the form of the letter "L." The important machines, those requiring the most light, are along the 30 foot side of the shop. The work and tool benches are at the end. Various factors enter into the placing of the machines and the points involved will be taken up in due course. A space of approximately 12 by 20 feet is available for an assembly floor, and this space is so marked on the accompanying plan.

Placing the Lathe

In placing the lathe we had in mind the fact that this machine was the one most in use. Simply by virtue of its manifold uses this machine should be placed in the most accessible space. The matter of illumination is important, as well, and therefore there is but one place for the lathe, in a corner with its tail toward a window.

A clearance of at least 18 inches should be allowed at the back of the lathe, more would be unnecessary, less would be a handicap. It often happens that one must walk behind this machine to make an adjustment; it often happens that two people are required to lift a job into place and therefore the 18 inch clearance at the back.

The countershaft for the lathe should be located as nearly against the wall as possible, first because it will mean maximum belt length and tend to make for a more positive drive and second, because a slight slant to the belt is advisable. If the ceiling is low, then it is all the more reason for placing the countershaft at the rear where it will not limit the head room.

If, as in our case, there is no crowding of the machinery, it is well to leave a space of two feet at the tail between the lathe and the end wall. It often happens that one wishes to face off a rear axle housing or do a job of a similar nature and unless there is room at the tail of the lathe, for clearance, the job cannot be done. A 24-inch space can be utilized, if necessary, for the setting up of a "dummy" tail center where the work is too long for setting up in the ordinary way. We cannot see any reason why the space should be greater if the machine is used for automobile repairs only.

We feel that no argument is needed to convince the repair man that a lathe is necessary equipment for automobile repair work. That the lathe is essentially necessary, is an axiom. You cannot expect to do even ordinary repairs without a lathe any more than you can build a house without a hammer.

The next tool which we consider may require a word of explanation for its installation in our shop, we speak of our "Variety Saw." In installing this tool we had in mind the fact that there are thousands of shops in the country located in farming districts where harvester and tractor work is general. We consider the circular saw, of the type which we have, to be indispensable in such a class of repair shop.

The Circular Saw

Once you have installed a saw you will wonder how you managed to get along without one in the business. Instead of running your shop on a losing basis during the dull times of the year you will find that you can manage to utilize every working day. You will soon find that your patrons are growing in number because they realize that you can do body work as well as the mere mechanical adjusting. If one of your men can repair the body of a truck while you are working on the engine, then your patron is satisfied that his valuable machine is being repaired in the shortest space of time possible. He don't have to wait a week for you to repair the engine and then a second week for some body maker to repair the body.

The variety of uses of this machine are in its favor. If your patron is in a hurry for a certain part it is possible for you to make the pattern and build the part without waiting for it to come from the factory. There is ample reason for a circular saw in every garage or repair shop.

In placing our saw we were influenced by the fact that this machine requires maximum clearance from all walls. It follows that the center line of the saw blade should be far enough beyond the front of the lathe to prmit sawing a 12-inch plank and as nearly central as possible in regard to the length of the shop. For practical purposes it is not considered advisable to bring the saw to the center of the shop as regards width because such a location would limit the working space of the assembly floor.

We located our saw three feet from the wall and the saw table is approximately three feet square which means that the saw blade itself is about 4½ feet from the side wall. The inside edge of the table is 2 feet from the end of the lathe which brings the center of the saw approximately 12 feet from one end wall and 13 feet from the other; as near central as practical without wasting space.

The Only Objection

The objection which might be brought up relative to the fact that 4½ feet from the side wall limits the saw to cutting-off lengths of that amount or less will be answered later in this article.

Since the clearance for the saw, at the back, is three feet it is permissible to locate the next machine, the drill press, fairly close to the wall. A space of two feet is left between the saw table and the base of the drill press and the latter is placed one foot from the wall. The post of the drill really limits the range of that machine at the rear and it might be argued that the drill could be set against the wall without impairing its usefulness.

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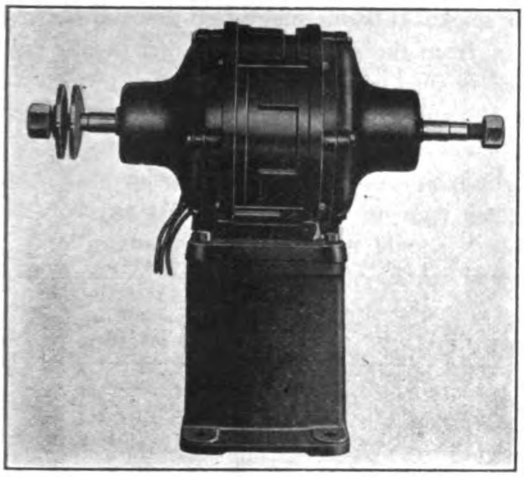
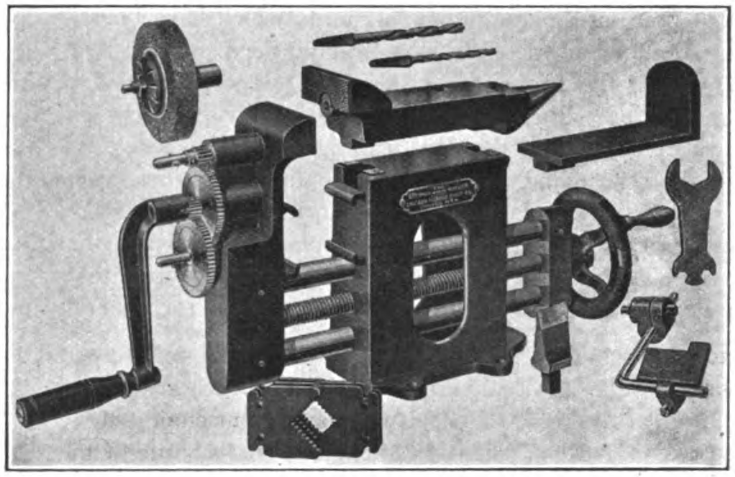
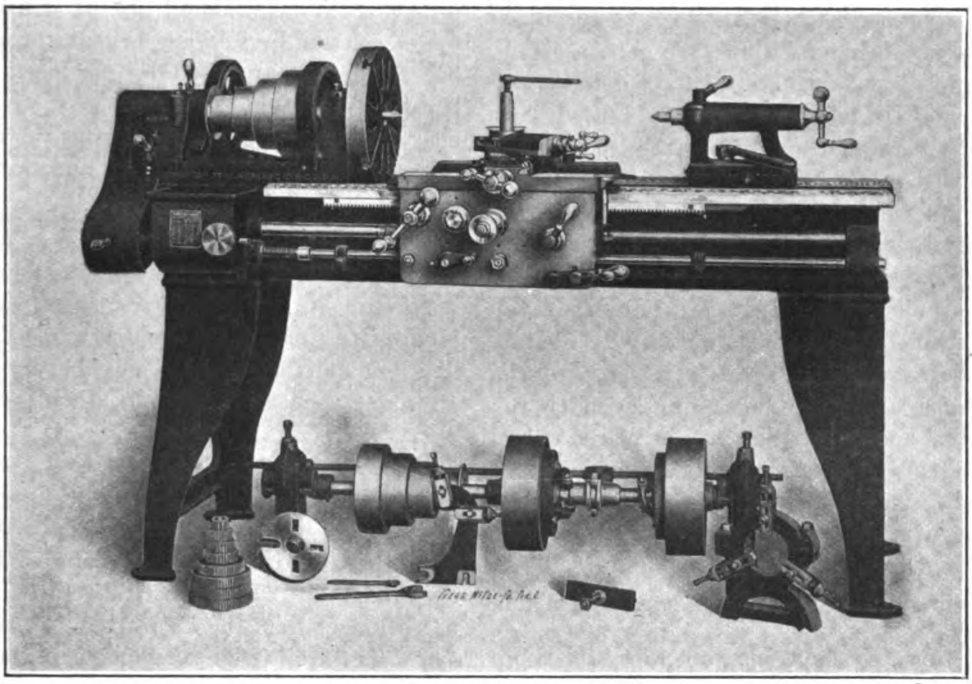
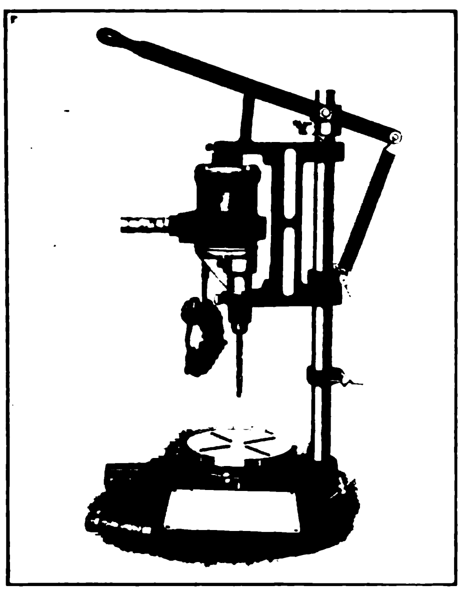


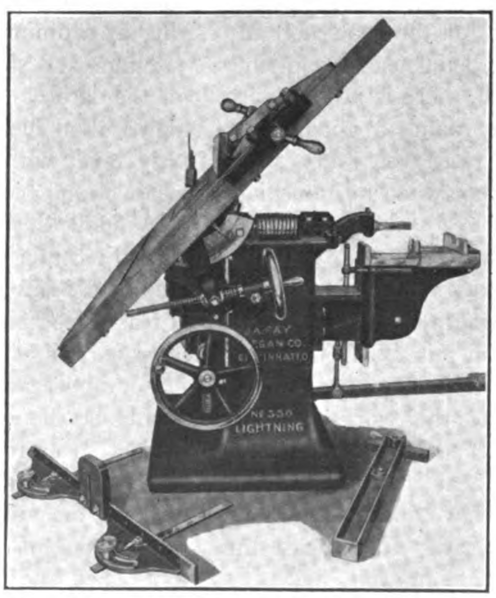


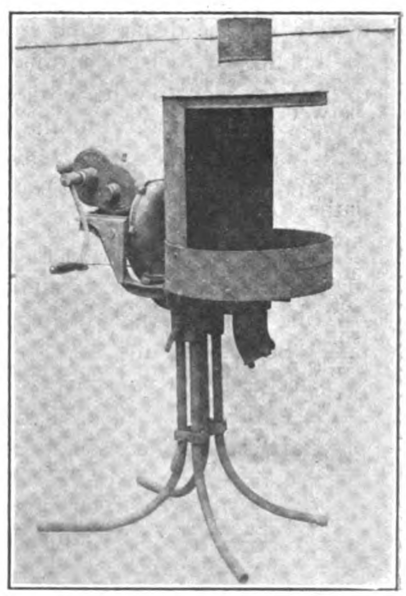
Above: Valley Electric Grinder. Below, at Left, Standard Electric Drill and Stand. Center, the Fay & Egan Variety Saw.



Above, The Stewart Handy Worker; at Left, the Champion 12-inch Lathe; Below, the Champion Forge.







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To a certain extent this is true, but one must not forget that there are many automobile units which have "overhanging" members. We have in mind the front and rear braces of the frame, for instance. If it were necessary to drill into either of these braces the job could not be accomplished were the drill placed against the wall. If, on the other hand, the drill is brought out further from the wall there is danger that the work will be limited because of its confliction with the supporting column of the saw. Taking all things into consideration we feel that we have placed the drill in an ideal location for general work.

The Work-Bench

Four feet further along on this wall we have placed the work-bench. Our readers will note our designation of this bench as being different from that of the bench next to it. The work-bench, as the name indicates is used purely for the handling of work, and not for the storage of tools. The bench should be kept clean, at all times, from tools not being used for the job in hand. This bench is made of two-inch oak planks; it measures two feet in width and six feet in length. It is fitted with three legs along the front and three along the back. It is fastened to the wall but can be removed and relocated if necessary. It is not wise to build such a bench integral with the shop simply because additional tool equipment may be needed in its place.

With this lay-out along the front side of the shop, all of the power machinery is in line and may be driven from one line shaft. If it becomes necessary to add other machines such as milling machines, cylinder regrinders or re-borers and so on, they may be placed either along the wall and in place of the work-bench or away from the wall and in line with the rear of the saw bench. Any low machine which does not conflict with the saw bench may be placed in line with that machine.

The Tool-Bench

The tool-bench may be built integral with the shop. Our bench is eight feet in length by three in depth. Cupboards, shelves and receptacles for small tools are located on the wall at the back of the bench. Since the bench is merely for the display and storage of the tools and for the holding of tools when they are being used from time to time for work on the work-bench, there is no necessity for special lighting. On the other hand, a good, clean wall space is necessary. Have a place for every small tool and keep the tools in place except when in immediate use.

In the writer's experience, which covers some 15 years of machine shop and laboratory work he has found that the rule stated in the foregoing paragraph is an excellent one. Before starting each new job put *all* of the tools in place and you will save time.

Place the tool bench as near to the work-bench as practical, bearing in mind the fact that you will need at least two feet clearance. Also bear in mind the fact that the end of the bench should not conflict with long boards which may be ripped in the saw. In our case the bench is located five feet from the front wall.

The location of the forge depends entirely upon the location of the stack. It is our suggestion that the stack be located 12 feet from the end wall as shown in our plan and the forge will then come in the location shown. Experiment has shown us that the forge should be placed as near to the stack as possible. We have also found that the best draught is obtained if the forge smoke-stack leads into the big stack high up on the latter. At any rate the forge smoke-sack should not have a right-angle bend in it as we know much to our sorrow after working with tearful eyes in a smoke laden atmosphere.

We consider the forge to be an essential unit of the repair shop. The repair man who relies upon a smith for his tools is sadly handicapped. The forge has many uses, not only for tool making processes but also for mending frame members and the like.

The placing of the vise, which in our case is an all-around machine, the Stewart Handy Worker, was a problem. We considered placing it upon the end of the tool-bench and by so doing bringing it nearer to the forge but finally compromised by placing it upon the work-bench, at the right-hand end. We have found that it is near enough to the forge for practical work and being on the work-bench, has a heavy foundation.

Windows and Doors

The matter of locating windows and doors is extremely important, not only from the standpoint of lighting but from that of utility. A window is usually placed to admit light and for that purpose only, but in our plans the windows are used as part of the shop, as will be hereafter seen.

Window A on our diagram is at the tail of the lathe. This window should be directly in line with the center of the saw and its sill must not be higher than the saw table when the latter is at its lowest point. The same holds true of window E. By this arrangement a board or plank much longer than the shop itself can be run through the saw. The front edge of window A should not be nearer the front wall than a line drawn along the front way of the lathe. In other words the wall at the tail of the lathe should be unbroken to form a solid base for the rigging of a dummy tail on the lathe if necessary.

Window B should be so located as to illumine the head of the lathe. The sill to this window should not be higher than the lathe bed. If this sill can be placed exactly level with the lathe bed, then the combination is ideal. Long pieces can be extended through the window.

Window C should be located with its center on a line with the center of the saw. The sill should be even with the lowest saw table position. This window should be at least three feet in width and serves to illumine the drill press as well as to admit long boards to the saw.

For appearance's sake the sill and size of window D should be the same as that of window B. It should be located so as to light the drill press from that side and the work-bench. If this window is extended beyond the edge of the vise, so much the better.

The edge of window E should come to the end of the tool-bench and its height has been mentioned previously.

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Windows F and G are merely for illumination and should be placed for this purpose.

One large double door, wide enough for admitting the widest truck is located directly in front of the assembly floor.

Location of the Stack

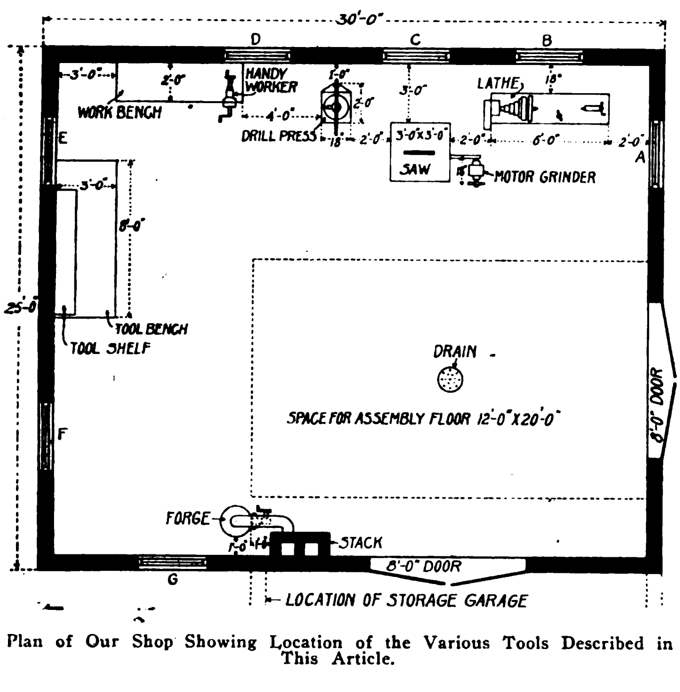
We spoke about the location of the stack and a further word might be helpful if one is erecting the building. With the stack as shown there is opportunity to use it for carrying off the smoke from the heater, should such a device be installed in an adjoining storage shed.

For the man who is constructing such a building we suggest that he consider the location of the storage department upon the side which we have indicated.

The matter of power is one to which we have given much thought. As we have said, the placing of the machines has an important bearing on this subject. The owner has a choice of driving each machine by an individual motor or installing one large motor or a medium sized motor for driving one machine only at a time.

In our shop we decided to adopt the most economical method of all, of installing a small motor which could be used as a grinder or buffer and using its power to drive any one of the machines.

Unfortunately no electric power line is available to our shop and we were forced to use the lighting circuit. Under these conditions we were limited to the use of a ½ H. P. motor and though this motor is theoretically inadequate for the purpose of driving the average shop it answers our purpose. The reader must understand that with this small amount of power we can drive but one machine at a time and that machine cannot be operated to its full capacity. We have found that a motor of two horse power is satisfactory and that a three-horsepower motor is more nearly the ideal.



Plan of Our Shop Showing Location of the Various Tools Described in This Article.

Whatever the size, however, the placing of it, as shown in our diagram is the most satisfactory. Our motor runs at 1800 R. P. M., an ideal speed for the purpose, and drives the saw directly by a belt. One end of the motor shaft is fitted with a pulley, the other with a grinding wheel. The latter may be removed and a buffer, or other device attached in its place.

The main driving shaft may be placed directly over the pulley on the motor and fitted with two or more pulleys of different sizes for driving the lathe, the drill press or other machines. When the saw is in use the belt to the main shaft is removed and the saw belt substituted. In a later article we will explain more fully our plans for a variable speed transmission system for our shop.

The various machines in our shop will be fully described in this magazine in succeeding issues. For our equipment we are under obligations to the following manufacturers:

12-inch lathe—Champion Tool Works, Cincinnati, Ohio.
Variety Saw—J. A. Fay & Egan Co., Cincinnati, Ohio.
Drill Press—Standard Electric Tool Co., Cincinnati, Ohio.
Motor Grinder—Valley Electric Company, St. Louis, Missouri.
Forge—Champion Blower & Forge Co., Lancaster, Pa.
Vise and Handy Worker—Chicago Flexible Shaft Co., Chicago, Ill.

These six machines are illustrated herewith. Our small-tool equipment will be considered in a special article.

OVER HEATING THE MIXTURE

By George G. McVicker

DRIVERS often complain that the engine does not seem to have its proper power after some attachment has been placed on the manifold to heat the charge. The method of pre-heating is an ideal time and fuel saver in starting or during cold weather, but when the engine heats up and on heavy pulls in hot weather this pre-heating lessens the power of the motor.

The power from each charge depends upon the amount of its expansion when it burns and the more it is expanded by pre-heating, the less it expands on burning as well, since less of it can be admitted at each charge. This cuts down the expansive force of each charge and can be noticed in the resulting power of the engine.

THERE WAS, BUT ISN'T

There was a man who fancied
  That by driving good and fast
He'd get his car across the track
  Before the train came past—
He'd miss the engine by an inch
  And make the train hands sore.
There *was* a man who fancied this;
  There *isn't* any more.

—*Soo Line Magazine.*

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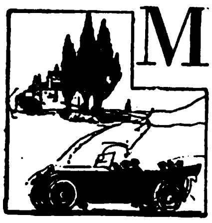
Resurrecting An Automobile

Why the Old Car Used Up Several Gallons of Fuel Nearly Every Night

By James F. Hobart



MR. SMITH had noticed that there was a carburetor on his automobile but had never given it any attention. Too many other things were "howling" to be taken care of and as long as a thing worked well enough to make the car go—and come home again—Mr. Smith just "let well enough alone" and attended to the things which were haunting him the worst.

But after a while, whenever the car came in from a run, there was a most horrible odor of gasoline in the garage. In a few hours, the odor would be gone. Finally, Mr. Smith saw gasoline dripping from the carburetor in a lively manner and began to "sit up and take notice." He had made a gage with which to measure the gasoline in the tank. A piece of board was planed a quarter of an inch thick and one inch wide and about 20 inches long. One day he cleaned out the gasoline tank—took out a lot of water and dirt, and measured back the gasoline which he had drawn off.

There were just two gallons of the fluid and Mr. Smith put the stick into the filling hole and marked on the stick, the level of the two gallons of gas. Then when he took gas, he made the garage man put it in a gallon at a time and marked on the stick, the level of each additional gallon in the tank. One day before beginning a 24 mile trip, he determined to keep tabs on the gasoline, so he measured it with his new scale and found six gallons in the tank. Upon return from the 24 mile run, he measured the gasoline again and found exactly two gallons left in the tank.

Next morning, Mr. Smith sounded the gas reservoir again and found only one gallon of gas in there instead of two! He had intended to go out again the night before and had pumped up two pounds of air pressure in the gasoline tank because he had not gone out, the pressure was left in the tank. Mr. Smith figured that a gallon of gasoline had leaked out over night while the two pounds of air pressure were forcing gas through a leaky carburetor!

Taking Out The Carburetor

The carburetor was removed from the car after a lot of work, but it proved a whole lot of trouble and branched into a lot of other things which had to be taken care of. The instruction book said there was an electric heater on the carburetor but Mr. Smith could find only a lug where the coil had evidently been attached —one time—and a pair of wires cut off and their ends taped over where electric connections had once existed with a carburetor heating coil.

There were two quarter-inch tubes leading from the carburetor, one at the top, the other at the bottom. Mr. Smith began to wonder what the second tube was for, regarding the lower one as the gasoline tube from the tank at the rear of the car. It was an awful place to work at the screwed unions on those two tubes. It was far down among choke and accelerator levers with no room whatever for a wrench to move after it was placed upon the nut of the union. Mr. Smith tried every wrench he had, borrowed three from a garage and then went and bought one before he could loosen all the bolts and unions around that carburetor. The two nuts on the unions of those two pipes were of different sizes and Mr. Smith wondered who did the standardizing when that car was built!

Finally the union was loosened and the pipe-joint broken down, when liquid began to flow from both pipe and carburetor although Mr. Smith was sure that the gasoline was shut off at the tank. He tried to stop the flow of liquid from the pipe and the carburetor. But he couldn't do it and finally had to couple the pipe to the carburetor again and screw the union home before the flow of liquid could be stopped.

Nothing But Water

Then Mr. Smith went on a still hunt along that tube and finally it was found to issue from the bottom of the radiator and did not come from the gasoline tank at all! He tried in vain to close a small stop valve which he found in the copper tube close to the radiator. But that valve couldn't be made to close and it didn't until after Mr. Smith had drained the radiator, removed the tube and unscrewed the little stop valve and cleaned it thoroughly. The valve was stuck fast, rusted tight to its seat, although brass, and the plug had to be forcibly driven out before it could be started. The valve after having been thoroughly cleaned and well oiled, was replaced in the radiator and the tubing omitted.

The tube entering the upper end of the carburetor was found to enter the water jacket of the third cylinder close to the top thus forming a thermosyphon water circulation through the water-jacket of the old carburetor. The cock in the upper tube was also "stuck" fast and had to be taken all to pieces. With the two water tubes out of the way. Mr. Smith found the real oil tube which entered the carburetor down near the bottom on the back side.

The carburetor had to be disconnected from the manifold and the gas tube straightened a bit so the carburetor could be pulled out of its hole, before that gas tube could be disconnected. Finally the carburetor was re-

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moved and taken apart. It proved to have a cork float and was a jet carburetor pure and simple, with no auxiliary air or gas openings whatever. There were no means whatever for regulating the amount of gasoline which could be pulled through the jet opening. There was a choke-valve but aside from the throttle, no way of controlling the amount of gasoline which might pass through the float valve to the carburetor.

Grinding-in the Float Valve

The float valve was found to leak. Air could be easily blown through it and by sucking with lips and tongue from the other side, air could be readily drawn through. The valve was a round bit of brass made a quarter of an inch in diameter, then squared to 3/16-inch so gasoline could pass along the squared sides while the corners served as guides for the plug. Mr. Smith had no grinding material, so he took a bit of Florida sand, pounded it with a nail hammer while spread on a piece of iron, then tied the hammered sand in a bit of muslin and shook through the cloth some of the finer particles which were mixed with water and used for grinding-in the valve.

"I used water to mix with the sand" said Mr. Smith "for the reason that water-mixed sand washes out very easily and does not lodge upon the oily surfaces of valve, stem or tube." But, grind as well as he might, Mr. Smith could not make that float-valve tight after it had been put together again. The plug and seat seemed well-ground and bright and would hold against suction from tongue and lips but as soon as gasoline got into the valve, the valve failed to stop that lively liquid.

The Cause of the Trouble

Mr. Smith looked the carburetor all over, shook his head and ordered a new carburetor at once to come by express. Then, he "went after" the old carburetor, took out the float valve plug and got right down to business with his "double specks" on, and located the trouble. It is shown in the engraving and Mr. Smith found two things which prevented the valve from stopping all the gasoline when the float came up.

As shown by the first sketch, the corners of the squared plug had become worn—or the hole had worn—so that there was nearly a sixteenth of an inch play of the plug in the hole. Thus, while the plug stood in the hole in the valve seat, the top of the plug inclined at least one-thirty-second of an inch, sometimes in one direction, sometimes in another. It was also found that many grindings had formed a wide seat for the 45-degree valve-plug to rest against. The seat was found to be more than one-sixteenth inch wide so that when the valve plug inclined to one side as shown by the sketch, there would be so much angularity of bearing in the conical plug against the wide seat, that the plug was tipped slightly off one side and left an opening for gasoline to pass through.

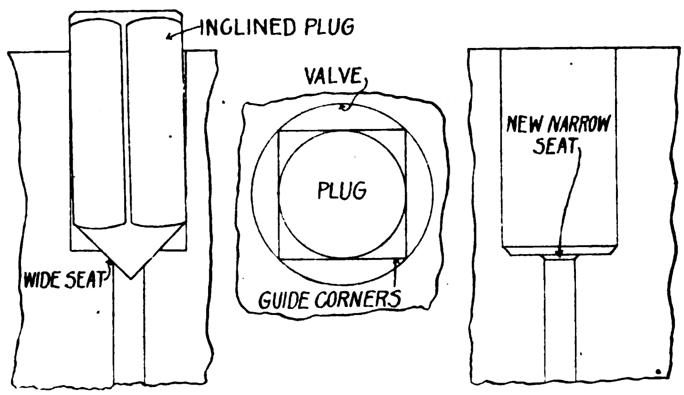
Mr. Smith had a new plug turned out in a lathe and then squared so that the corners were left a little less than one-thirty-second inch wide. The corners fitted snugly yet easily into the hole in the valve and as shown by the sketch it was impossible for the plug to incline very far in either direction or to tip upon its seat. To reduce still further the chance of leakage, Mr. Smith had a machinist run a flat-end mill into the valve-hole and leave a very narrow seat, only about one-sixty-fourth inch wide. The well-fitting plug, resting upon this very narrow seat could not tip sidewise far enough to tilt the plug so that gasoline could find its way through when the float was "up."

That stopped the carburetor leakage but Mr. Smith kept right on getting ready for the new carburetor. He said that while the jet carburetor worked very well with the gasoline in use when that form of carburetor was made, the jet carburetor had no business with modern automobile fuel or so-called gasoline which was at least 30 percent heavy oil instead of volatile gasoline.

The New Carburetor

Finally the new instrument came to hand Mr. Smith prepared to install it. First he made a test run with the old carburetor and found that while it had been getting six or seven miles per gallon of gasoline while the float valve was leaking, that he got about twelve miles per gallon after he had put in the new plug and resurfaced the valve seat!

He took the new instrument apart to *see how it was made* and to find out what he had to contend with in the new instrument. It had a metal valve float, an adjust-



The Float Valve Trouble Illustrated at Left and How It Was Repaired Shown in the Two Right-Hand Illustrations.

ing screw by means of which the amount of gasoline which could pass from the float bowl could be absolutely limited except as drawn through the adjusting valve by varying degrees of partial vacuum in the carburetor air passages.

There was only the amount of gasoline to be adjusted and once the proper position of the needle valve was found, which he discovered by trial was with an opening between three-quarters and seven-eighths of a turn, Mr. Smith never had to touch that adjustment. There was another screw and check nut adjustment of a spring which forced the float valve to its seat in addition to the lifting power of the float.

The spring was to take care of the air pressure on the

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gasoline in its tank, by means of which the gas was forced to the carburetor under a pressure of one to two pounds. Once the spring in question had been set and its adjusting screw locked by the check nut, Mr. Smith forgot it and never had to touch the adjustment again.

The Gasoline Spray

There was a peculiar arrangement in this carburetor by means of which gasoline was forced into the air in a thin flat and circular spray which offered great area of gasoline to the passing air and instead of the gasoline entering in line with the passing air, the gas was injected crosswise making a very effective distribution of the raw gasoline which, by using the choke valve, could be drawn right into the engine cylinders, making priming unnecessary. In fact, Mr. Smith removed the priming cup-valves soon after he had gotten acquainted with the new carburetor; which did, upon test, give a little better than 18 miles to a single gallon of gasoline!

When Mr. Smith got ready to make the test, he placed three one-gallon cans of gasoline in the car and started out, along one of those Florida brick roads, with very little gasoline in the tank; only a half pint or so. When the car stopped for lack of gasoline, he noted the speedometer reading, emptied one of the gallon cans of gas into the tank and started out again and ran under ordinary conditions, stopping several times, until the gallon of gasoline was all gone. Then, he took another speedometer reading and found he had gone 18.1 miles.

A word of explanaton is due here, for the speedometer on Mr. Smith's car, while in excellent condition, was lacking in two respects—the gear and the shaft were missing and had been since the car was purchased. Lost in some repair garage by the previous owner of the car and Mr. Smith never could locate the missing parts and had not gotten around to replace them. But he got a speedometer reading all right for a friend went along in another car and there was a good speedometer on the friends' car and that is how Mr. Smith got speedometer readings without a gear on the autowheel or a shaft to connect same with speedometer on the dash.

An Additional Check

As soon as the gallon of gasoline was exhausted, another was put into the tank and the car started home again. The return trip was made with the *low* rear axle transmission gears in mesh while the out trip was made in rear-axle *high,* this car having eight different speeds, six ahead and two reverse. The second gallon carried the car almost exactly 16 miles, a speed of about 20 to 25 miles an hour being maintained on both in and out trips.

Mr. Smith said that 16 and 18 miles looked good to him compared with six to eight and thirteen miles with the old jet carburetor and that he liked the new instrument because of the quick pick-up of the motor.

I have gotten ahead of my story in telling of Mr. Smith's road tests of the carburetor for I wanted to tell right here how well the instrument worked out. Now, we will look back and see what Mr. Smith "got up against" while installing that carburetor. It fitted into place perfectly, where the variation of a quarter of an inch would have caused trouble. The air valve or "choke rod" proved too short and Mr. Smith made a new rod from the most crooked piece of three-sixteenth inch wire you ever saw. He found the wire in the gutter and straightened it nicely. It was galvanized steel and did the trick neatly after once bent into shape and put into place.

REPAIR TO TOOL POST

By Charles H. Willey

THIS idea may come handy to someone who meets the problem of having a broken tool post on a large lathe. I had one break as shown in Fig. 1, and after annealing it, I cut it off and made a dog or finger, as shown in Fig. 2.

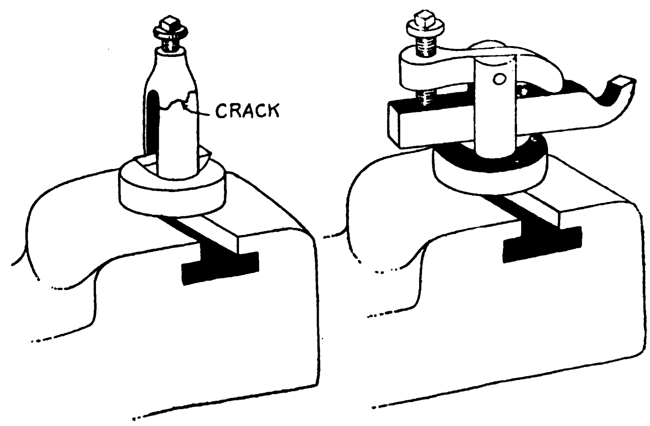

Fig. 1 at Left Showing Broken Tool Post. Fig. 2 at Right Showing How It Was Repaired.

This worked all right and was a much quicker repair than a new tool post, though a new one was later obtained in order to have the full tool space. The idea could be used to advantage when making a tool post for any lathe for it holds the tool rigid.

A store looks no better to a customer than the man looks who is waiting on that customer.

Efficiency has its own reward.

It is mighty hard to make the world forgive a man who confesses and reforms.

Some people keep up appearances even though it costs them more than it is worth.

The man who is irritable about home can exercise a lot of patience when holding the end of a fishing rod.

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Making Cheap Lathe Tools

The Process of Welding Tips of High Speed Steel on Tools

By Donald A. Hampson

THIS article may appeal to the car owner who has some shop facilities of his own or to the garage man who wants to save on his tool steel expense by utilizing his spare moments or to the shop man who wants a specially shaped cutting tool that may be prepared more easily by adding a previously formed blade to a shank than by forging or machining. Any kind of tool

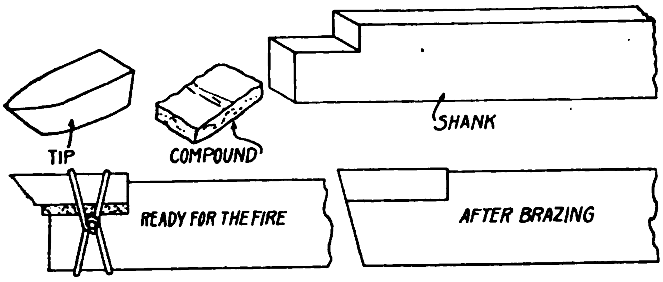

Fig. 1. Simplest Form of Welded Tool Tip.

steel may be thus secured to any kind of a shank but the logical arrangement is to use a high speed steel blade, or "tip," and attach it to a soft steel shank, providing one with a tool whose great body is of an inferior metal while the point is of expensive, high grade cutting steel.

We will deal with the method of brazing on these bits. The writer has used Laffite brazing plates with marked success. It is a method open to anyone who has a forge. Lathe and shaper tools, drills, and special tools can be produced by tipping though it is advisable to limit the use of built-up tools to those where the cutting stress is continuous—not jarring and intermittent as in chipping or planing.

Fig. 1 shows the simplest job. A rectangular notch is cut at the top of one end of what is to be the tool's shank, the notch being the size of the piece of steel to be brazed on. A piece of the brazing plate is broken off to the size of the tip or a little larger. This is

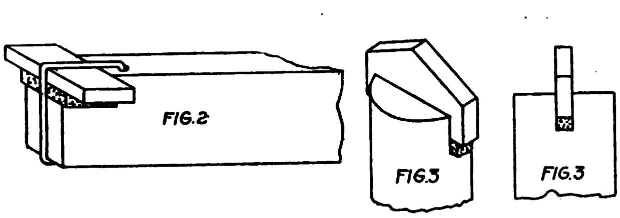

Fig. 2 and 3. Holding the Tip for Welding and a Boring Bar Tip.

laid on the flat of the cut and the tool on top of it, which will bring the tool about 1/8" higher than its intended position. A piece of soft iron wire is wrapped around to hold the bit in place while handling.

The idea is to get the parts to a red heat; this will fuse the brazing plate and bring the steel pieces to a brazing heat. The compound contains all the ingredients for brazing and when a red stage has been reached, all that is necessary is to press the steel pieces together in the desired position.

The "trick" of the job is to balance and hold the tip in place while in the fire. When the parts get red, the compound melts and this lets the bit sink, releasing the grip of the wire which may or may not drop off, depending on how the piece is handled. When the compound melts, it runs and it runs up as well as down to some extent and in so doing spreads enough of itself over the vertical wall to braze there as well as on the flat. A flame of purplish, never to be forgotten, color is given off by the brass and flux as melting takes place. When this appears, the work should be quickly removed from the fire and given a tap or two with a hammer while resting on the anvil—this presses the bit firmly to its seat.

If high speed steel bits are used, the work may be allowed to cool itself and will then be ready to grind, preparatory to actual service. If the bit is of ordinary carbon steel, it will be necessary to harden and temper the point for its particular use. The bits may frequently be odd or discarded pieces as old milling cutter blades,

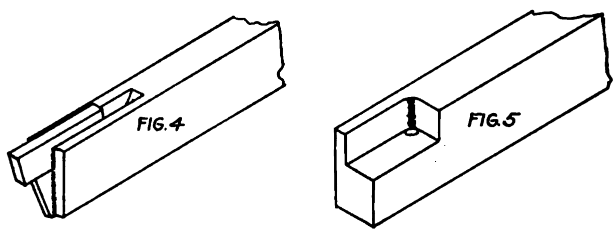

Fig. 4. Cutting Off Tool. Fig. 5. Side Turning Tool.

too holder bits too short for service that way, or short ends from bars.

Almost any style of tool may be constructed in this way. Several examples will be given in the other illustrations. This method is sometimes very convenient for making a special reamer, using a piece of shafting with milled slots and blades brazed in them.

Fig. 2 is a tool having the bit placed crosswise of the shank. The projection makes it possible to use this for either a right or a left hand cornering tool—or such a tool could be made up with beveled corners for regular turning. Attention is called to the method of wiring on the bit.

Wiring is necessary in most cases for the hand movements of the process invariably displace the bit. The case of Fig. 3 is an exception for here it is possible to

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make a tight enough fit between the sides of the slot in the stem to hold the bit where wanted. This shows how a flat drill with high speed tip may be made. The brazing plate is laid under the bit at the bottom of the slot and several light grooves are cut in the sides of the slot to allow the molten brass to run better over the wide surfaces.

A cutting off tool is shown at Fig. 4 and at Fig. 5 a turning tool with a side shoulder to resist heavier cutting strains.

Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered by An Expert for Your Aid

By Joe Bell

THERE never was any luck in the Bell family. We always had to work for what we got and nobody ever seemed to think any more of us because we never bought a thing until we had earned the money. And, much to our regret, we didn't get in on any of the big wages or profiteering of the war time. But listen.

In 1915, March it was, our sister bought a Ford, paying $395 of good hard earned money for the same That was in the days of the brass radiator and hand cranker. That touring car travelled a good many thousand miles that year and in the years to follow. During the unusually severe Winter of 1920, the extreme cold in the garage (and elsewhere) caused the paint to peel off in great sections; these bare spots were later covered with one of the advertised home paints but it never looked the same again and the car was left habitually dusty to conceal these defects in its complexion.

Last September, our sister decided that she was sick of her Ford—it didn't start good anyway—and a nearby garage sold it for her, turning over to her $350 as her share of the deal. Fords had been in great demand, it had been impossible to get enough of them new or second hand, and those in good running order brought high prices. Getting $350 for a $395 car after having it six years was mighty good—and it was the first time the Bells had ever got in on the right end of a deal. But when, the very next week, Ford prices dropped to the $400 level again and that for a regular car, the Big Laugh began. So to-day whenever you see one of us Bells laughing all alone, you know it is over the feelings of that poor guy who sunk his money in the brass radiator.

* * * *

IF I wanted to break into the auto game and get in a branch where I would have plenty of work, no competition, and become a pointed-out figure in the community, would I become an electrical wizard or a radiator expert? Not I. I'd invest $2000 in a cylinder grinder or re-boring machine and get the business that is just begging to be done right in my own town and for fifty miles around in all directions. Think of the new blocks that are bought, think of the oversize pistons that are "fitted" into cylinders worn out of shape, think of the vastly greater number of cars that do not get even this treatment because the owners know these things are not the real solution! Yes, I'd make one grand stab and buy the very best machine for re-sizing there is, then I would install it in a clean, light, roomy place, and have my clients bring around their cylinders. I wouldn't do garage work, I wouldn't take off or replace the cylinders but I *would* make a *real* job of grinding cylinders, into which I would fit the oversize pistons that are stock with manufacturers.

* * * *

QUITE often it is desired to tell whether a cylinder *is* round or not or if it is worn toward one end. The inside micrometer is the correct tool for measuring bores, but such tools are not overly plentiful and some other means has to be employed. There is an element of uncertainty about the inside micrometer that really makes it less reliable than the uninitiated think; first, it depends entirely on the user's ability to *caliper,* just as if ordinary clipers had been used; second, unless a person is more careful than the average garage man he is apt to get particles of dirt between the shoulders of the instrument when assembling it and this throws out the reading in actual inches; and third, many of the tools of this class are not micrometers and do not pretend to be—they are ***inside adjustable gages*** with ***micrometric graduations.*** So we see that except with particular tools and those in the hands of trained workmen, an attempt to measure cylinder bores with "inside micrometers" is no more accurate than a caliper measurement.

Even if a real inside micrometer is correctly used, it is always safest to measure, or check, its setting between the faces of an outside micrometer. This will then give a true measure of actual diameter.

But there is a simple and fully as accurate way of telling when a cylinder is out of round and of comparing the size at different points. Suppose the cylinder is a 3⅞ inches. Take a piece of ⅛ inch round steel, cut off a little more than this length, and then file the ends square until the piece is the thickness of a line on a steel rule over 3⅞ inches. Put this rod in a lathe chuck and file the ends slightly rounded but do not make it any shorter in the center. Try this rod in the cylinder. Hold one end *fixed* at any desired point and move the other back and forth about an eighth of an

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inch, at the same time carrying the path of these oscillations from the outside, inward. At first the rod will clear, but as it nears a line at right angles to the axis of the cylinder, the free end will begin to strike and if it will not pass by the right angle line, it will have to be filed a little shorter in the lathe.

If this is repeated until, with delicate strokes at the free end and the other firmly fixed, the rod passes the right angle point with a movement of 1/16 of an inch, then the rod is not more than 0.001 of an inch under the

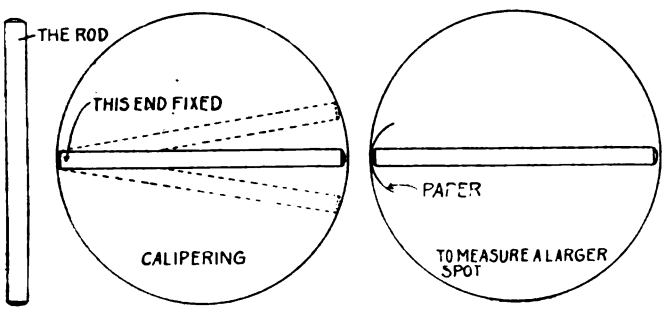

Fig. 1. Measuring Cylinders With Paper.

actual bore of the cylinder at that point. A measurement of the rod in an outside micrometer would tell just what this was. Returning now to comparison of diameter at different points, it is possible by using pieces of paper under the fixed end of the rod, as shown in Fig. 5, to measure this as exactly as if with a real micrometer. If the difference is slight, a piece of cigarette paper under the fixed end of the measuring rod will be enough to restrict the oscillating end to a sixteenth of movement and this will prove that there is a difference of 0.001 of an inch between the two points measured because that is the thickness of the paper. If there is more of a size variation, use a piece of typewriter paper, which is usually around 0.002 of an inch thick or for more still, most newspaper today is 0.004 of an inch and so on by using known thicknesses or by micrometering pieces that serve to give just the right "feel" to the rod, and any inaccuracy may be gaged. It is all a question of how carefully one can caliper and it must be remembered that the possession of an inside micrometer is no guarantee of ability in that lines.

One machinest that I know works a slick trick in measuring cylinders. He has a one inch outside micrometer that he always carries with him in his vest pocket. When this is closed—reads to O—it measures exactly 3.750 of an inch over all, from the rounded end of the sleeve to the rounded screw head at the anvil end. Now, this makes a neat and useful inside micrometer for cylinder work for bores between 3¾ inches and 4¾ inches. The rounded ends permit calipering just as has been described with the rod. Originally, the tool did not measure exactly 3¾ inches, but the machinist perceived its value if it did and he filed a trifle off the ends; now if he puts it in a cylinder and it reads 0.250 of an inch on the barrel, he knows that the bore is 0.250 of an inch + 3.375 inches or 4 inches — and **there he is.**

TURNING and slotting starter commutators is an everyday job in all large garages. Commutators regularly are made of the same diameter throughout but there is no reason, when they come up for repairs, why they should not be "necked" in the corner. The brushes never reach in the corner, so as the bars wear down a shoulder is formed there which must of necessity round the corner of the brush and have a tendency to crowd it toward the outer edge. If a neck one thirty-second of an inch deep and an eighth of an inch wide is turned while the armature is in the lathe, it will prevent this crowding and give the brushes a chance for better, longer contact. The neck is also of assistance when re-turning and when cutting out the mica. Brush holders that stagger the brushes wear commutators much more evenly—often in-line holders can be altered slightly to this end.

One place that has a milling machine and a pair of plain index centers for it, does commutator slotting in a novel manner. This slotting, or cutting out the mica between the copper bars, is a well known preventative of gummy, dirty brushes and burned bars but it is a tedious job and one that ordinarily requires much skill to produce a first class job. Fig. 4 shows the milling machine method. The rotor is put between the centers with a lathe dog on one end. A piece of a hack saw blade is ground to the shape of a cutting tool and is clamped between two collars on the milling machine arbor with another piece of blade to balance the grip.

With the index pin in one hole of the circle corresponding to the number of bars, turn the rotor until the

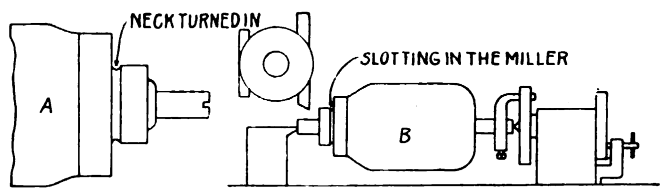

Fig. 2. How the Commutator Was Turned and Slotted.

mica filler lines up with the hack saw cutter—and then tighten the dog screw. By indexing around, hole to hole, the mica lines up every time and there is no guessing nor gouging. The machine spindle is locked against turning and the work is fed against the cutter by means of the hand feed. A neck at the inner end is essential. This method relieves the job of all its uncertainty and is a time saver in the end, quality considered.

* * * *

SOMEBODY brought in the coil set from a Mercer a few days ago with the instructions to turn the commutator. They said this last quick-like and slipped out before we had time to tell them what an impossible piece it was to hold in the lathe. The outside diameter of the coils is about 18 inches—they are not strong enough of themselves to grasp in a chuck, and they set back from the commutator ring so far as to preclude the use of a good sized chuck entering and gripping the ring on the small part of the jaws; you couldn't

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reach the commutator to cut if you turned the piece around.

We had the equipment to do the job but it was one of those jobs where you have to spend four hours getting ready to do fifteen minutes of cutting. For the benefit of others who may be puzzled by this same thing, the drawing, Fig. 6, shows the way it was worked. A five inch, independent jaw chuck was put on a twenty inch lathe and the jaws turned big end outward. This gave us half an inch of grip inside the commutator ring. This looked good to us but when we started to true up the

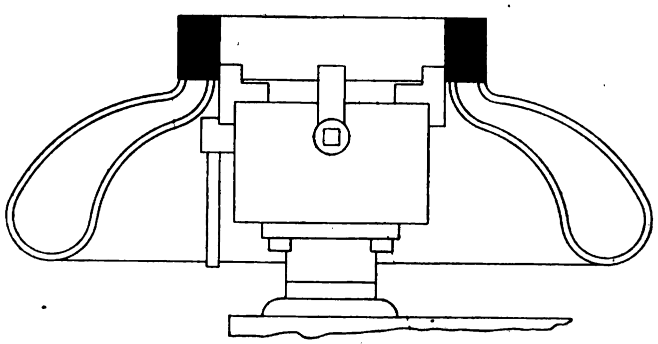

Fig. 3. Holding the Mercer Commutator.

job by the unworn part of the commutator (which is the only machined surface on the whole assembly), we found we could not get a chuck wrench in under the coils to shift the jaws. We made a special wrench that could be turned in this cramped space.

Then it was a short job to make the piece run true and almost as short to dress up the yellow bars. In doing this job, care must be exercised in adjusting the chuck jaws because their unsupported state will not permit of a heavy grip—the latter would mean disrupting the assembly or spreading out of a true circle.

* * * *

DODGE rear axles have a square shaft end that fits in a bushing that, in turn, is fitted into the hub and there is a one-quarter inch pin put down through all three parts, retaining them in a fixed longitudinal position. These pins do shear off.

A better fix is shown by Fig. 3. The straight one-

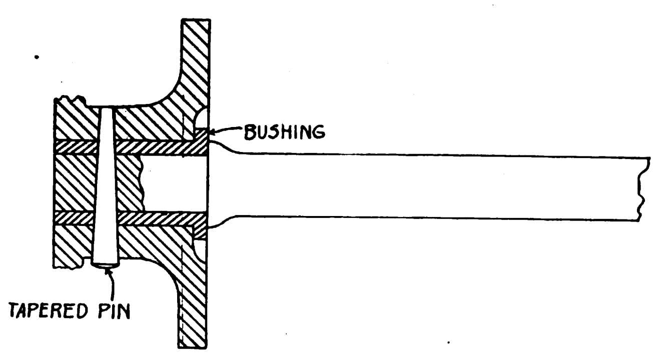

Fig. 4. Repairing the Dodge Rear Axle.

quarter inch hole is enlarged and made tapering to fit a No. 6 taper pin. The enlarging does not weaken the shaft at a vital point. It does present almost twice the shearing strength of the old pin and it has the advantage of being drivable to a very tight fit.

THERE are times when a person has to use a car without adequate brakes. Careful driving will minimize the risk on the road and a stone placed behind a wheel will safeguard the car when it is left standing. In descending hills, a shift to a lower gear will suffice to hold the car back to a reasonable speed. On city streets, the car should always be left with the down-hill wheel against the curb. Another good way for the car owner to provide against running away is to leave the car "in gear"—leaving the car in low or reverse is the best kind of an engine brake.

* * * *

ALL FORDS are supposed to carry oil up past the pistons to where they can foul plugs and cylinder walls. The pistons are made as shown at A in Fig. 1 with a slightly beveled corner next the cylinder bore: this naturally would permit what oil was on the walls to squeeze past. One owner of a fleet of trucks reasoned this out and decided to make a change such as is illustrated at B.

He had the pistons taken out and put in the lathe and the skirt and turned off, removing the beveled part. Then the inside was beveled to about a 45-degree angle, the idea being that this shape would scrape the loose oil from the cylinder walls on the downward stroke and carry it up inside the piston, reducing the amount that

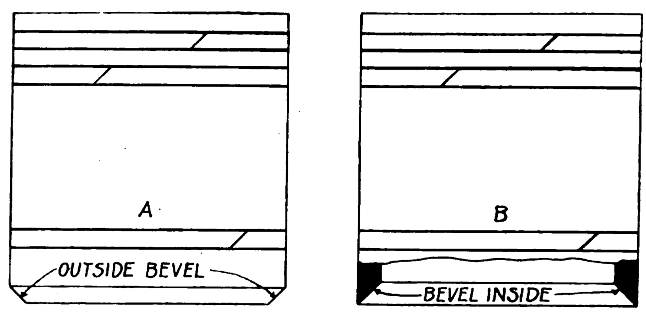

Fig. 5. Curing the Ford of Oiling Trouble.

could possibly get up to the plugs by any means whatever. And this man reports a considerable reduction of plug fouling. If there were no machine shop handy or none that could be trusted with what is a delicate job, this same end may be attained by filing the inside, using a 10-inch square file; this way is safer for the average man and it does not necessitate removing the rods.

* * * * *

THOUGH most of the present cars are built without magneto ignition, there are many cars running that have no other form of electrical energy. The switch in the circuit of these high tension mags stops the engine by grounding to the car frame, the wire from the breaker box being the ground wire, which sometimes is carried quite a distance before connection is made with the frame. Many a man has cranked a heavy motor to the perspiration point only to find that there was a short in the ground wire; though seemingly all right and well insulated, there has been a leakage of the high tension current at some invisible spot.

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it aside, then use a stick of wood to keep the rotor in place with the cover spring turned back to its usual position to hold the stick up while the motor is being turned over. When such procedure is not possible, the brush may be removed and the cover replaced—the former method is, however, the more positive test.

Automotive Field Service

Service Is Almost as Important to the New Car Owner as the Car Itself

By Joseph G. Worker

Vice-President, Phoenix Mfg. Co., Eau Claire, Wisc.

MILLIONS of dollars go into the automobile scrap heap every year. Much of this is waste; useless extravagance; but the real cause of this scrap heap is not enough "Preventitive Engineering" in the field. The genius of American engineers in building up the automobile manufacturing industry is well known. It is one of the marvels of this age and due to this genius the depreciation account, insofar as automobiles are concerned, is gradually getting more in line with other industries.

Individual parts are being made better so that they wear out more slowly and break less often, due to the hard, every day stresses and strains that come in the operation of an automobile, tractor or truck.

The automotive industry is in substantially the same condition today as other industries when they were young. The agricultural implement industry went through distressing years, mainly on account of the fact that the Field and Service work was not well organized. Those actually engaged in automotive repair work know that something has been done in building up the field work.

Still the following statement of one of the leading automobile authorities is amazing: "About 1,750,000 passenger cars were produced during the calender year 1920. Part of these constituted no addition to the number of cars in operation, but served only to replace worn out cars. The balance applied towards an increased registration.

If we estimate the average life of an automobile at six years, we find that in 1919 those cars produced in 1913, plus imports and less exports replaced. In other words out of the 1919 production of 1,657,652 cars, 437,955 were required to replace those which were scrapped. In 1920 if we estimate that 70,000 cars were exported, we find that 515,600 cars replaced those made in 1914, leaving 1,164,400 to be added to the total registration. If we turn now to next year's business and assume that the same number of automobiles will be produced as in 1921, we find that about 795,000 cars will be required for replacement alone."

Certainly the above figures indicate the possibilities for the organization of the field forces of the automotive industry. When we take a statement that 800,000 cars in next year's production will be required for *replacement alone,* something is wrong. Considering past business events, however, in this calender year, it is probable that there is not going to be 800,000 cars built to *replace scrapped* cars. There already is an attempt to make the life of a car last at least one year longer, and this is being done by intelligent repairs to those vital parts that will restore cars to good use and efficiency.

This leads into the trouble with the organization of Automotive Field Service. Considerable literature is available giving the reasons why owners of automobiles should have their cars repaired at certain definite periods. Many reasons have been established why this should be done. It would seem that owners of automobiles are becoming convinced that this is a good thing to do, but what is the result when they go about doing the things that are necessary to have their cars repaired?

It can be said that, in a large majority of cases, the practice has been, in all garages, to attempt to repair automobiles, trucks and tractors with very little mechanical equipment. Most garage equipment consists chiefly of the hammer, chisel, hack saw, screw driver, etc., with the result that after a repair job has been done the cost (which no doubt is an honest one) has been so exorbitant that the car owner leaves disgusted with the whole scheme of automobile repair work. All we have to do is to take our own actual experiences, and it will not take very much to convince one that something is wrong in the service end of the automotive industry.

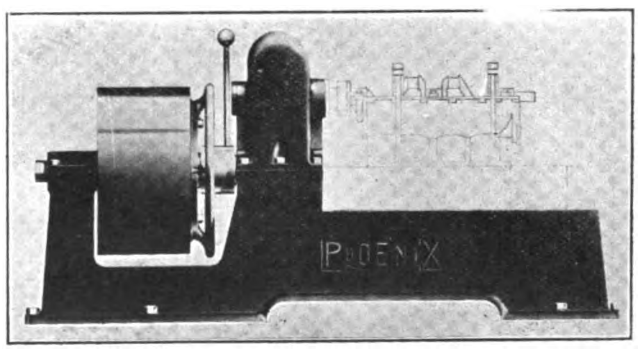

Fig. 1. An Engine Bearing "Running In" Machine.

The trend of progess, however, is going to change this. There is going to be little possibility of a reduction in the price of good cars. Automobiles do not cost too much now, considering the plant investment, the engineering organization that is necessary for its operation, and all

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those things that must be taken into consideration in the cost of making an automobile. There is, however, going to be something done to make a car cost less for up-keep, and instead of lasting six years maybe seven or more years. Most everybody has been prone to place the responsibility of this scrap heap on the automobile owner. A careful analysis, however, will show that it does not belong there entirely. The automobile owner is being rapidly educated to the fact that it is necessary to take proper care of his car if he is going to have any pleasure or service out of it. By and by, however, he is going to demand, when he puts his car into the service station that they have necessary mechanical equipment for the proper repair operations.

One prominent automobile manufacturer told me that

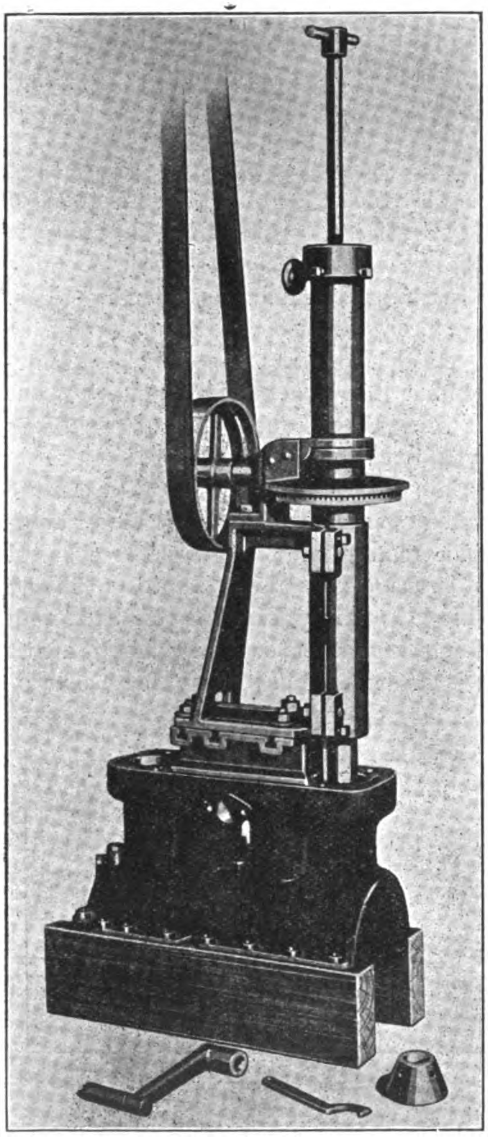

Fig. 2. A Portable Cylinder Reboring Machine Which Is Fitted To Handle Practically Any Size or Type of Cylinder Block.

in his opinion, it would not be very long before a purchaser of an automobile, truck or tractor would be making inquiries of Sales agents, or Sales organizations of automobile companies, as to the facilities they had for repairing their cars, or what facilities they were connected with in that immediate community for doing this work. He stated that the replies being made at present to these inquiries, to the effect that they would be looked after insofar as any minor troubles were concerned, would not suffice. This purchaser would want to go and convince himself whether or not there was proper equipment available for repairing the car. In other words—he wanted to know whether his car was going to be repaired by hand, which he knows by experience to be a very expensive way or whether there was mechanical equipment installed for taking care of the different repair operations.

Some automobile companies have already realized the value of this field service. They have probably taken cognizance of the fact, that sooner or later, poor field service will reflect back on to the original purchase of automobiles. For this reason some manufacturers are equipping all of their service stations with efficient machinery, such as is required to give service to the automobiles that they manufacture. It is understood that they will insist that these service stations have necessary equipment for every important repair operation. It is not at all improbable that it will not be very long before these properly equipped service stations can tell definitely how much it is going to cost to do different kinds of repair work and repair operations.

It cannot be demanded or even suggested that all garage service stations in the United States be loaded up with a lot of mechanical equipment. Each business will have to be analyzed separately to determine just what is best. There are, however, a few tools that every garage that does any repair work should have. There is no question but that, in a little while prices will be set for different repair operations in connection with the repair of cars and it will be found that the service garage cannot repair a car *by hand* at the figure that will become established. In order to compete, garages will have to be provided with garage equipment and then they can repair a car at a reasonable figure and still make a profit for themselves.

The time is approaching when the repairing of automobiles must be done more scientifically. For example, at one of the repair clinics it was shown that a certain repair job could be done (with garage equipment) to cost approximately $25.00, while a garage that did the same kind of work by the old hand method, charged the customer for this same work $165.00. There is at this time need for something that will stablize this field repair service, and probably the answer is Proper Organization of Field Forces and Mechanical Repair Equipment.

There are already on the market labor saving machines, and devices that a number of automobile and service stations are putting into their plants. Some of the most commonly used tools at the present time are as follows:

Running-in and Burning-in Machines

These machines are used to burn-in and run-in bearings of motor blocks. The operation is done in so much shorter time compared with the old method of scraping bearings that there is no argument against equipment. After the bearings have been burned in, the motor block is turned over (fig. 1) and the bearings, connecting rods and pistons are limbered up while running in oil.

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Cylinder Reboring Tools

One of the most common operations in repair work is reboring cylinders. There are many types of reboring tools on the market (Fig. 2) some of which are operated by hand and others by power. With this tool the garage has every opportunity of doing a cylinder reboring job very quickly and efficiently and above all, accurately. These tools are equipped with cutters to give true and precision work, and so designed that chattering is practically eliminated.

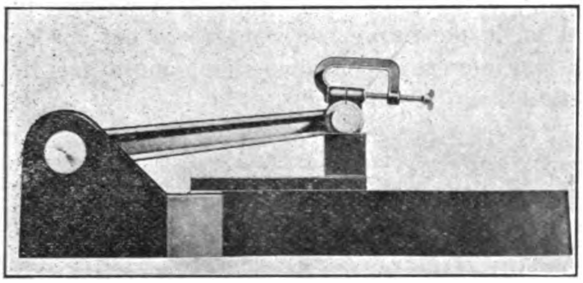


Fig. 3. Jig for Checking Up the Trueness of Connecting Rod and Wrist Pin Bearings.

Rebabbitting and Reboring Outfits

There are many simple and economical reboring outfits that every service station should have. These outfits are so made that skilled mechanics are not necessary for their operation. Bearings of blocks are easily and quickly rebabbitted and rebored and then the bearings burned in.

Connecting Rod—Aligning Gauge

In repairing any motor this tool is very convenient for testing the alignment of connecting rods so that if they are out of alignment, they can be straightened before reassembly. This too (Fig. 3) enables one to quickly locate or correct any twist, bend or any other inaccuracy of the rod and for testing the trueness of the bore and the piston.

Assembly Stand for Motors

It is very handy to have something to attach the block to when doing any work, considerable time is lost by inconvenient handling. These stands eliminate the common practice in garages of placing motors on the floor, necessitating stooping over to perform necessary work of assembling, etc.

Drills, Arbor Presses, Grinder Stands, Straightening Pressers, Etc.

There are a number of good machines of this character on the market that are adapted for garage work. They are not too expensive but what may be called semi-machine tool. All of these are not required in garages only, doing minor repair operations, but most of this equipment is found in modern repair shops.

Valve Reseating Tools

These tools are very valuable as they do away with unnecessary grinding. They are so designed to provide means for grinding the valves the same as when the motor left the factory. Some tools on the market are equipped with a motor, so they are portable and easily moved about to suit the convenience of the work.

Combination Front and Rear Axle Stand

One machine of this type on the market is equipped with vices to make the axle housing accessible for removal of the roller-bearing sleeve and to permit the easy removal of the differential and rear axle shaft. This stand has proven very beneficial in repair shops. The rear axle can be placed in any position. The tool tray and axle support can be folded up when not in use.

Angle Iron and "V" Blocks

"V" Blocks (Figs. 4 and 5) are especially suitable for holding round bars, piston heads, etc., work that is ordinarily inconvenient to handle and hold rigid because of its shape. The blocks are designed for clamping to a drill press or other machine tools. The Angle Irons (Fig. 6) are important and a profitable tool for garage equipment. There is more work to be done than ever before, and it greatly increases the efficiency of the shop if one is able to conveniently and inexpensively handle drill work. These Angle Irons are about 5"x6"x5" high and found generally useful for holding odd shaped pieces on the drill press, in the lathe and on other machine tools. The tool is built to hold the work rigid. If one desires to hold work with bolts instead of with clamps, holes can be drilled in the Angle Iron.

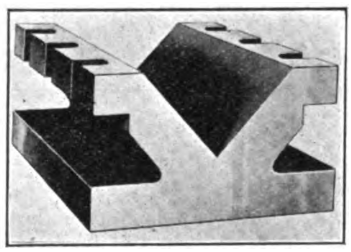


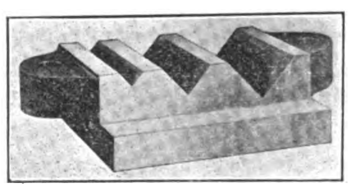
Fig. 4. Single V Block for Holding Round Objects to be Machined.

Electric Test Stands

These outfits are very necessary when a garage does any amount of electrical equipment work. There are several on the market designed for the purpose of testing all electrical equipment of automobiles, trucks and tractors.

Brake Relining Machines

This machine is designed for relining automobile brakes. One machine on the market is suitable for all types and sizes and is equipped with five sets of punches and dies. It will shear the head from the old rivets and



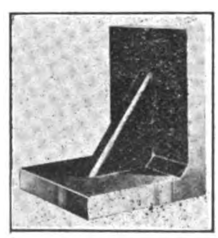


Fig. 5. Above, Triple V Block. At Right, Fig. 6. Angle Block.

(Continued on Page 57)

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Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.
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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

Our New Department

IT seems an especially appropriate time, in this Tool and Machinery issue to announce our new mechanical department. And because we feel that this department is bound to be of great value to our subscribers, in the future, we have ventured to give its announcement first place in our magazine.

It has always been our aim to make this magazine one of practical interest to the mechanic. We have tried to cull out all articles of theoretical nature and to publish only such manuscripts as have a sound, mechanical reason for their existence. More than this, we have tried to remove the 'high-brow" air and to dress each article in a suit of working clothes, if we may use this simile; how well we have succeeded is attested by our growing circulation which is now well over the 30,000 mark.

Our policy might well be likened to that of the man who prefers to invest his money in a guaranteed, high mileage tire. He knows that he is getting the best that money can buy and can depend upon the tire at a pinch. The same amount of money might buy two or more ordinary tires but he could never be sure of them. He wants quality; not quantity and knows that quality gives service and is the cheapest in the long run.

And so it is with us, we aim to give our readers the best magazine, we aim to eliminate all useless words and sell just the "cream." And following this policy we have spent considerable money in equipping a work-shop. In this shop we will develop our ideas and when we pass them along to the reader he can be assured that he is obtaining suggestions which have been worked out fully.

Too many men have been obliged to waste money in experiment along lines already worked out by others. It has been said that experience is the best teacher and it is a fallacy to think that everyone must waste time or money in obtaining it. We will do the experimentation for our readers, we will undoubtedly waste both time and money in learning our lessons, but we will feel justified in the thought that we will have saved our readers from making the same mistakes that we may make.

And so, in the future, we want all of our readers to take a real interest in "our own shop" and to feel that it is literally "our" equipment.

Machine Tool Equipment

THE average car owner often raises the question: "What do I care about repair shop equipment so long as the work on my car is done satisfactorily?" and it is not an easy matter to convince him that he should patronize the garage where the equipment is fairly complete.

If the car owner but knew the inside workings of the average garage he would hesitate a long time before he entrusted his valuable machine to the hands of the mechanic whose entire equipment consists of a poor hammer and a still poorer monkey-wrench. This is an extreme but serves to illustrate the point which we wish to make. The mediocre equipment is open to the same criticism which we offer.

The car owner should be vitally interested in the equipment of the shop which he patronizes for two big reasons; first, because repair work by hand is very expensive and second, because hand work is seldom as accurate and satisfactory as that done with a machine.

A complete overhauling job, for instance, might be worth a few hundred dollars. The cost of new parts seldom represents more than ten per cent of the total overhauling cost. Labor is the chief item.

In order to offer any sort of reasonable competition, the poorly equipped shop must be able to quote a price fairly close to that quoted by the well equipped shop. Assuming that the prices quoted, in both cases to be the same, let us consider the facts.

The poorly equipped mechanic spends many hours taking out bolts, removing parts, grinding valves, scraping carbon and so on. If he replaces a bushing he uses a file, perhaps, to get an approximate fit. He cannot afford to put too much time into the job and consequently slights much of the work. Much of the work which he does is poorly accomplished and the overhauling job is at best an "over-mauling" affair. By spending a little extra time on the engine he can cover up his other points of neglect and the owner is none the wiser until a few weeks have passed and even then he cannot be sure but what the trouble is due to his own driving or mere accident.

In the well equipped shop, however, the speed wrenches; the gear and wheel pullers; the arbor press; and the various other tools reduce the routine work to a

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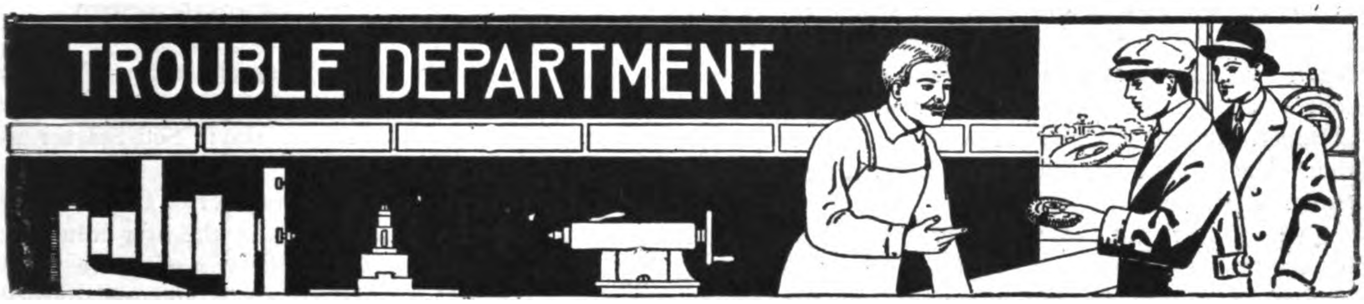
minimum. One mechanic with a speed wrench will take off every nut from the whole car in less time than the man with a monkey wrench can remove the engine bolts. With a portable crane a single mechanic can do the work of three without it. Accurate reamers, babbitting jigs, grinders and so on practically elminate human errors.

And there is another factor which should be considered. The workmen in a poorly equipped shop naturally try to avoid any distasteful work. The scraping of a bearing, the replacing of a bearing bushing which has "grown" into place; the removal of a unit which "seems to be all right" are jobs to be slighted. If, on the other hand, the workman has suitable tools to work with he he can finish the job before he tires of it.

And so we warn you, brother reader, to keep away from the shop where a sledge hammer performs the duty of the arbor press; where the strength of four men replaces the portable crane and where they fit babbitt bearings with a file. Suitable equipment for the work in hand is excellent assurance that you will not be overcharged.



More Air—Less Fuel

3029

From Chas. W. Fraser, New York: I was much interested in an article which was in your magazine, relative to carburetion. In this article you mentioned the installation of a pet-cock on the intake manifold as a means for saving fuel. I would like to know just why this claim is made because it seems that the needle valve in the carburetor must admit a certain amount of fuel under any conditions.

Reply: The amount of fuel passing through the needle valve is governed by two factors, the size of the opening and the pressure upon the fuel in relation to the pressure in the mixing chamber where the needle valve opens.

This fact can best be illustrated by reference to a water system. Suppose for instance, you turn on a faucet in your house. The amount of water passing through it, as you know, depends upon the opening of the valve. This is a simple fact, but suppose you open the faucet to its full extent. If the pressure is very low the water will flow out of the opening in a full size stream, perhaps, but not rapidly. If the pressure is high, then the water will rush out. The amount is determined by the pressure, and naturally this pressure depends upon the height of the water level and the air pressure acting against it at the faucet.

In the carburetor the case is very similar except that the pressure on the fuel is equal to that of the atmosphere only. But the fuel is driven from the needle valve by this pressure because there is a suction in the manifold. The faster the engine runs, the greater the suction and therefore the more fuel used.

From this you can see that the fuel used is governed by the suction in the manifold, if the opening is constant. Anything which you may do to reduce this suction, such as opening a valve in the manifold, will reduce the amount of fuel used.

The Ford carburetor, having but one adjustment, (the needle valve), must necessarily use a rich mixture at all times because the engine requires a rich mixture at low speeds. Practically, however, the engine will run at higher speeds on a much thinner mixture than the carburetor furnishes. And hence it is policy to provide a pet-cock in the manifold which can be opened after the engine has started.

Backfires Going Down Hill

3030

From E. M. Allen, Connecticut: I have an Overland, 1917 car, Model 85-6, which I have run over 40,000 miles without any trouble until lately. When the engine is running idle it will operate on all six cylinders without a single skip, but after the engine has warmed up and the care is operated on a down grade, then the thing fires back into the muffler. Can you be of help in solving the problem?

Reply: Backfiring into the muffler when descending a grade with the throttle closed is a healthy symptom in a gasoline engine, it is an indication that the mixture is an extremely lean one and for this reason economical.

Many drivers have wondered why the engine backfires into the muffler under these conditions. Any engine which will operate smoothly when idle, on a minimum amount of gasoline will pop back into the muffler.

The reason for this is not hard to explain. Assume that the engine will run idle and without skipping at a speed of 200 revolutions per minute or lower. Under these conditions the throttle is closed, or practically so. If the engine is speeded, then more fuel is required than if it is running at the 200 R. P. M. speed. And so, let us assume that the amount of fuel running into the

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needle valve at this low speed is exactly enough to operate the engine at this speed. The closed throttle only permits enough gas to pass to operate the engine at this speed.

Now supposing that this same engine is driving the car and a down grade is reached. The minute that the grade is sufficient, the engine ceases to work because the car rolls along by gravitation. Under these conditions the engine will begin to idle at its 200 R. P. M. speed, if the throttle is closed as it usually is. Under these conditions the engine will not backfire.

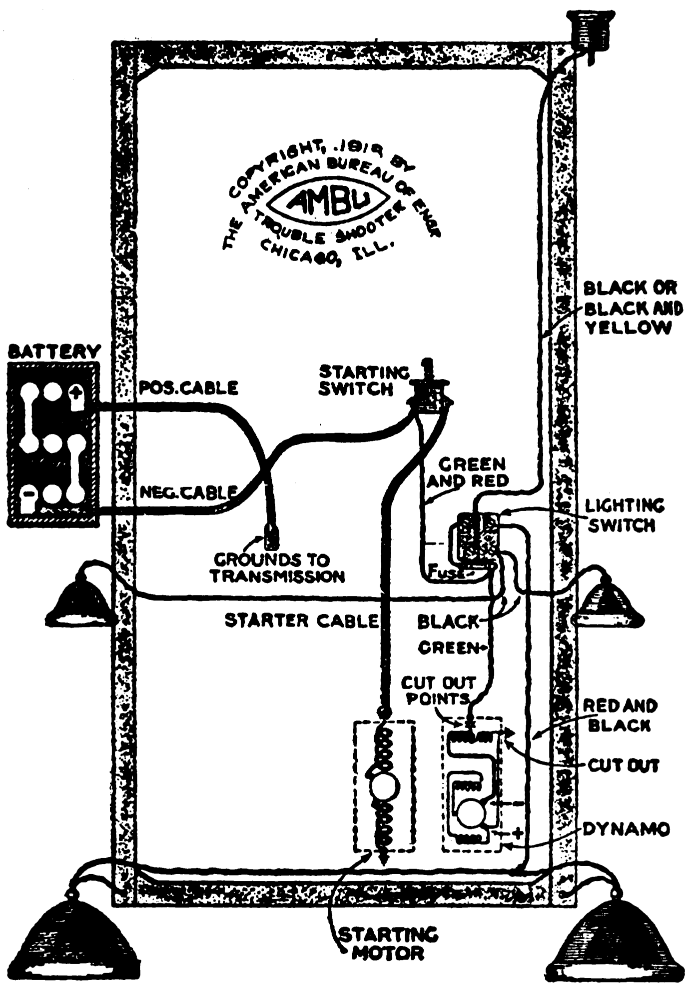
But the grade grows steeper and the momentum of the car forces the engine to run faster than it would were it simply running idle under its own fuel. There is not enough fuel passing into the engine to make a firing mixture; there is not enough gas to fill the cylinders properly because the throttle is closed. The cylinders are not only working under a partial vacuum at times, but the gas mixture which is in them is too thin. Under these conditions they will not fire at every explosion stroke.

One cylinder may require several intake strokes to fill it with enough fuel gas to explode. A certain amount of the gas, in the meantime is pumped into the muffler. Occasionally the mixture in the cylinders and in the exhaust line will be such that it will ignite and then will come the backfire into the muffler. The mixture in the exhaust line being ignited by the sluggishly burning mixture in one of the cylinders which happens to fire.

There is a possibility that the muffler explosion will burst that member and many drivers make a practice of opening the muffler cut-out while the engine is being used as a brake in the manner outlined.

As to a "cure" for the trouble, there is but one answer, "remove the cause." Adjust the carburetor to give an over-rich mixture and there will be no trouble. But in doing this you can expect to get less mileage from the fuel and more carbon from the over-rich mixture.

GRAY-DAVIS "FORD"
3rd Brush Regulation



Wiring of Gray & Davis-Ford System

3031

From H. A. Haskell, Massachusetts:—Will you please send me a wiring diagram for a Ford Touring car, equipped with a Gray & Davis Self-Starter and Lights?

Reply:—There are a large number of Gray & Davis systems, one of which is given in the first column on this page. If this is not the one you wish, we will be glad to give you the proper one if you will describe the system more fully. Give us the year and model of the car and the model number stamped on the various starting and lighting units.

Bulbs Burn Out

3032

From S. H. Puffenberger, North Carolina—I have a friend who drives a 1917 Ford car and who has asked me for help. I have tried to help but cannot seem to find the reason for the trouble. The head light bulbs seem to burn out very shortly after installation.

At first the machine was wired in the regular way, the bulbs, in series. The first thing we did was to install a regulating device and wired each light separately, in parallel, using six volt bulbs. They still burned out and we discarded the regulator and changed the system to series again using nine volt lamps. This resulted in very poor illumination and the bulbs continued to burn out.

At present the bulbs are wired in parallel, nine volt bulbs in each lamp, but they still burn out more often than they should. Can you suggest a remedy for the trouble?

In your opinion is it advisable to use a ball bearing in place of the regular thrust washer combination, on the left side of the Ford differential? What is the advantage of the ball-thrust bearing?

Would there be an advantage in installing a 4.2 to one gear ratio in place of the regular driving gears?

Reply—The Ford magneto generates 18 volts at its maximum speed and if two nine volt lamps are connected in series, they ordinarily last for many months. Many drivers connect the bulbs in parallel if maximum light is desired, though there is greater chance that the bulbs will be destroyed.

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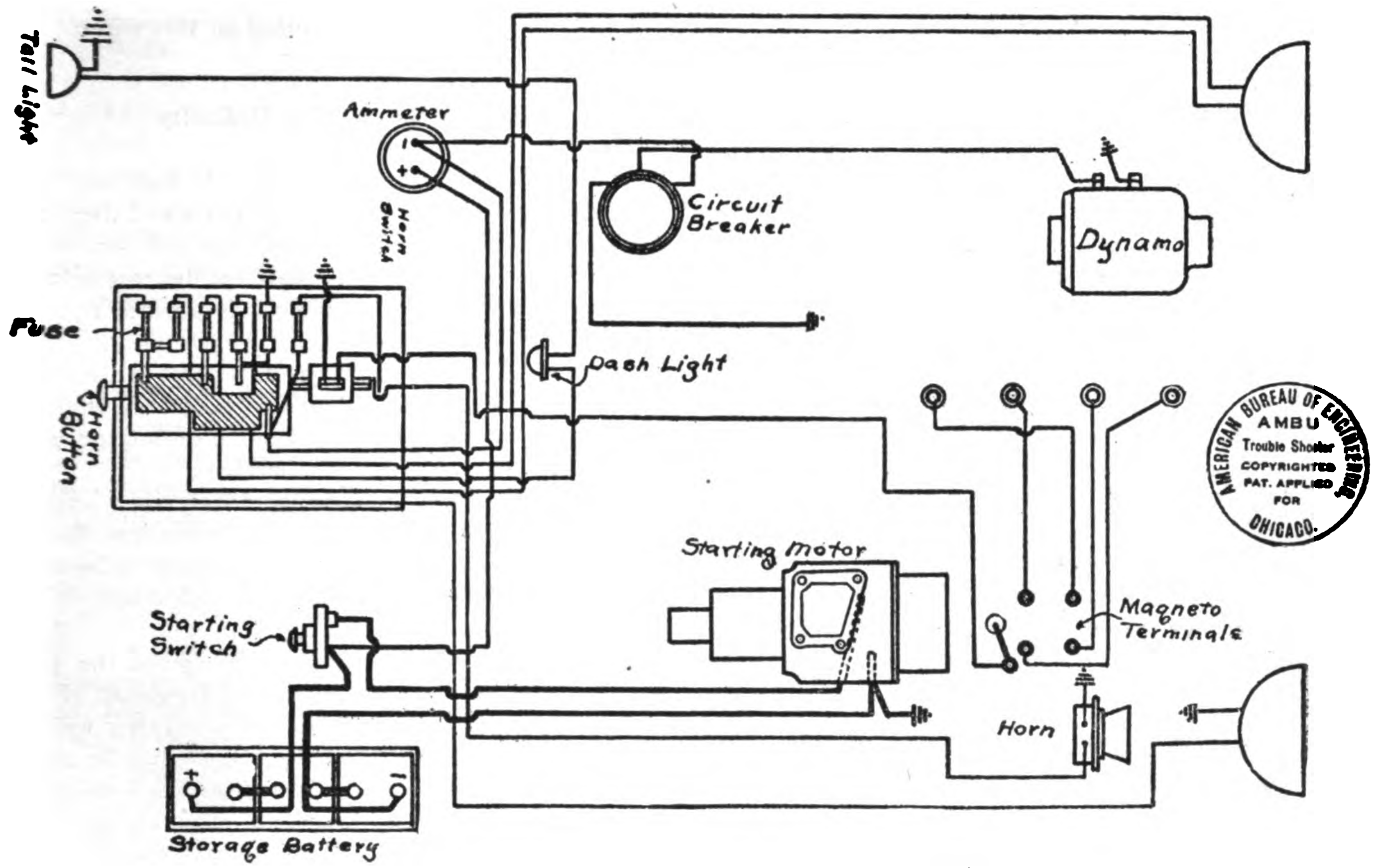
AUTOLITE Overland 1916 "83"



In your case, we doubt if the burning out is caused by excessive current. It is our opinion that the trouble is caused by vibration. We would advise you to examine the headlights very carefully and see that the bulbs are tightly in place. If you cannot find the trouble, install a complete new set of wires.

It is advisable to use ball bearings to take the thrust from the differential. The ordinary fibre and steel thrust washers may wear, in time, thus throwing the master gear out of line with the pinion, or allow the gears to mesh "shallow." When this happens the gears will wear very rapidly and new ones will soon be necessary. The ball thrust, aside from its smoother action, does not wear as rapidly as the fibre combination and has less frictional resistance. This means that the axle will run much smoother with the ball bearing.

With the 4.2 to one driving gear combination the car will have more power but less speed. This is an excellent ratio for machines which operate over sandy or muddy roads or in the mountains. Theoretically such a gear combination would make for more economical gasoline consumption.

Wiring of Overland Model 83A

3033

From a Bronx Subscriber:—Please send me a sketch of the wiring used on an Overland Model 83A car.

Reply:—The diagram requested is printed above.

The Ford Starting Motor

3034

From Albert Burch, Indiana—Will you please tell me the reason why the starting motor on the Ford engine gives so much trouble? Is it because it does not produce sufficient torque, or is it because the Ford engine is harder to start than other engines?

Why is the carburetor, on Ford cars, located so far from the cylinders? Would it not be advantageous to locate the carburetor nearer to the cylinder block?

Reply—The starting motor on the Ford engines is amply large enough to operate the engine at a reasonable speed for starting, if the engine is in good condition. The trouble, usually, is that the engine will not start readily and, in many cases, there is too much friction in the engine.

If you find that the starting motor on your car is not strong enough to turn over the engine, then it is safe to say that the bearings in the engine are stiff. Only by prolonged use, can the bearings be "limbered." If the bearings are fitted loosely, then the engine will knock. Use plenty of good oil and you will soon find that the engine can be started with the motor.

If the motor turns the engine over, but the latter refuses to start, then the fault is in the carburetion or ignition. Put a priming device on the intake manifold and prime the engine before you try to start it. Many motorists find that the engine starts easily if the primer is worked while the starting motor is being used rather than before trying to start.

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Although there are many arguments and theories in favor of locating the carburetor near to the cylinders there is still a question as to whether the advantages are great enough to overcome the disadvantages.

The manifold on the Ford engine cannot be considered as a "long" one when it is compared with some of the older "monstrosities" which were sometimes nearly half a yard in length.

Mr. Ford is to be complimented on one fact and that is that his product has been made on the same design for the past seven years or more. This means that one may purchase parts for an old car without paying a fancy price. Perhaps this is one reason why the manifold design has not been changed for the past ten years.

If the manifold were removed and the carburetor attached to the head it would mean an entirely different design in the engine and many of the parts.

As the matter now stands the gas is carried in a long, easy sweep to the intake ports. If the intake were shortened, there would be shorter curves in the intake passage and greater chance for condensation.

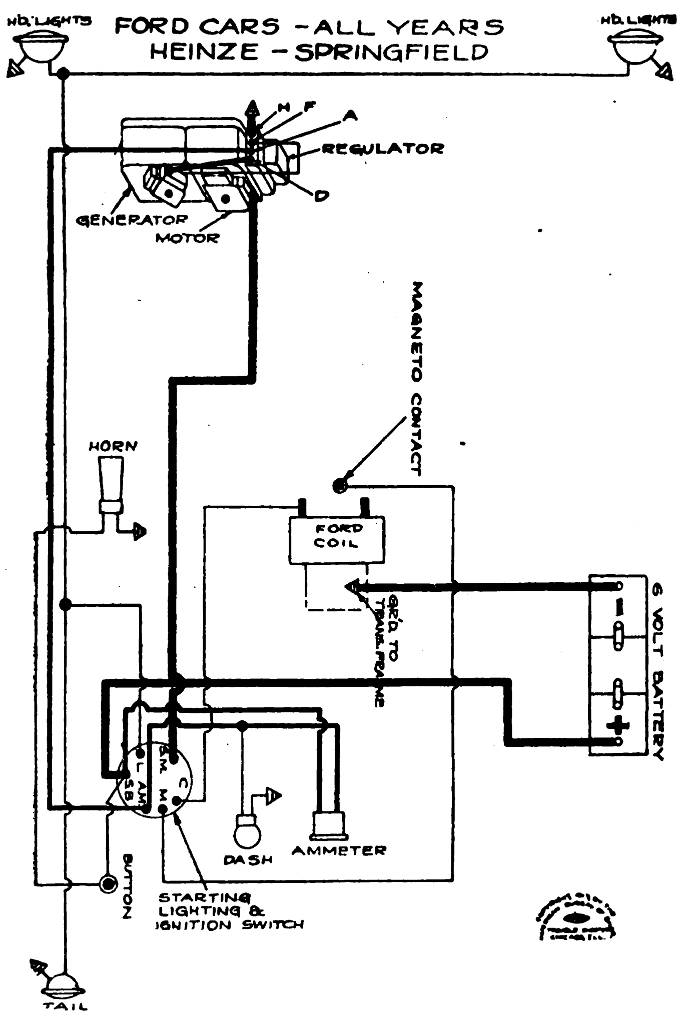
We believe that the present Ford manifold cannot be improved upon without changing the whole design of the engine.

Heinz-Springfield Starting Diagram

3035

From Martin W. O'Hare, Massachusetts:—Will you kindly publish a wiring diagram for a 1917 Ford with a Heinz-Springfield starting and lighting system?

Reply:—The diagram is printed on this page.



Engine Starts With Difficulty

3036

From V. E. Gravatt, New Jersey: My Ford car, when first being started, will fire once or twice and then stop. It does this a number of times before it will run continuously. The engine will not start on the magneto but will run on magneto better, after it is warmed up, than on battery.

Reply: The trouble which you experience is a common one and doubtless thousands of our readers are bothered in the same way. The trouble is in the carburetor which fails to vaporize the mixture properly.

While the carburetor is comparatively cold and the engine is cranked, a poor mixture is drawn into the cylinders. This mixture is not vaporous enough to be called a gas, but is simply a volume of air with drops of fuel suspended in it.

This extremely moist mixture hits against the plugs and the latter may fire it, but often the drops of raw fuel short circuit the plugs temporarily and they will not fire at all. The current from the battery may be strong enough to break down the drops of fuel and the plugs will fire more often then when the magneto current is used.

After the engine is started the mixture is heated by contact against the warm passages and no trouble is experienced. The remedy is to apply heat to the manifold or the mixture. There are a number of concerns making an electrically operated device for attachment to or inside the manifold, we would advise you to investigate such devices.

There is a second possible remedy, though not quite so positive. It is worth trying, however, since it is so easily applied. Install a set of "spark intensifiers" or "emergency spark gaps" to the plugs.

AN AUTO UNDER HOOD HEATER

By George G. McVicker

A very effective device for heating the engine while it is in the garage may be arranged by placing a socket at some point on the front of the dash, so that a one-hundred watt light bulb may be screwed in and connected with the city electric circuit.

A carbon filament lamp will throw off the most heat and should be provided, while the outside of the hood should be covered with a blanket, although better results should be obtained if an outside hood, constructed of heavy asbestos material, covering the motor and radiator, is used. A switch at the house may be connected so as to turn on or off the current in the event of bad weather.

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Types of Gas Forges

Heating Devices for Hardening, Annealing and Tempering as Applied to the Repair Shop

By J. F. Springer

THE up-to-date repair shop where miscellaneous metal repairs are made—as a gas company's repair shop or an automobile repair shop—should be equipped for handling steel in connection with such operations as the following:

1. Heating for welding.
2. Heating for forging.
3. Heating for annealing.
4. Heating for hardening.
5. Heating for tempering.

These operations are arranged in the order of the demands for heat. Thus, No. 1 requires a very high heat,

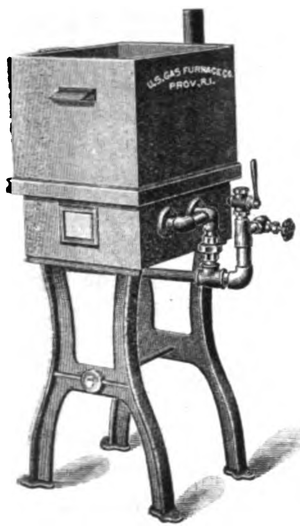


Fig. 1. Oil Tempering Furnace, Gas Operated. Made by U. S. Gas Furnace Co., Providence, R. I.

ordinary welding being done at about 1900° F., or even higher. The temperature required for tempering is in a range running, say, from 400° to 600° F. Naturally, with the temperature requirements running from 400° to 1900°, the equipment required for the best results will have to be of a varied character. One piece of apparatus will hardly answer. Nearly, if not quite, all of them may be of the gas-operated type, the gas being either city gas or natural gas.

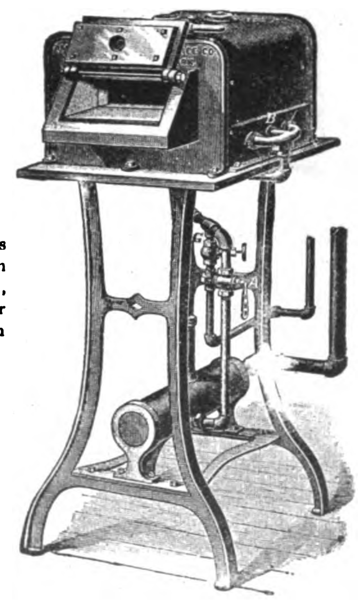
But the requirement for diversity of equipment rests on a broader basis than would be implied by the necessity for various temperatures in a 1500-degree range. That is to say, the operations differ in their demands for the management of the heat and for the protection afforded the work against the gases of combustion. This point requires perhaps a degree of elucidation.

The effect of heating from red to white is becoming more and more extensively known. A greater and greater number of operators on steel are learning that, as the temperature rises above medium cherry red, the grain size increases; and that this increase in grain size is accompanied by a reduction in the strength of the metal. This is the general teaching on the subject and is the point of view to be taken by the man in the shop. In short, steel heated above medium cherry red is steel that is more or less damaged. There are methods of restoration, one of which is annealing.

Now, welding and forging require higher temperatures than a medium cherry red and thus involve heating the steel through a considerable range of temperature characterized by growing grains. This is inevitable. A few degrees higher than a pre-determined temperature for either of these operations will make no great difference. This means that we are in for a big grain size anyway, so that a size a little larger will not make our troubles any greater to speak of. If the grain size is to be restored by the application of one of the remedies used for the purpose, then this remedy will probably operate with just about as much success even though the grain size is a little larger or a little smaller. Consequently, a heating appliance designed to heat steel for welding or forging need not be equipped with any special means for controlling the temperature.

On the other hand, if the piece of heating apparatus is for annealing, an adequate means for controlling the heat is a necessity if one seeks the best results. Annealing is done for one or both of two reasons. These reasons are (1) restoration of grain size and (2) relief of strains and stresses. Similarly, with hardening—it is

Fig. 2. Oven Furnace Gas Operated. Made by American Gas Furnace Co., Elizabeth, N. J., (Selling Agents: Anchor Tool & Supply Co., Inc., John St., N. Y. City)



needful to have a proper means of managing the temperature.

For both cases—annealing and hardening—the requirement for adequate heat control is largely imposed

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by the fact that generally when annealing and hardening have been done, no other high-temperature treatment will follow. Any enlarged size of grain at the close of these operations will remain in the finished and completed article. It is important then that the final temperature be not higher than the necessities of hardening and annealing themselves demand. The repair man should pause here and make sure that the significance of these remarks is fully comprehended. Otherwise, he is likely to handle hardening and annealing to the disadvantage of the work. For example—if the annealing operation really requires only 1325° F., but the work actually receives 1425° F., then this excess of 100° means that the steel is finally weaker than it would have been otherwise.

Overheating Means Weakness

Similarly, with hardening, an excess of 100° beyond what is really necessary means that regions adjoining the part required hard will eventually be weaker than need be. This matter is certainly important.

After the foregoing statement of the case, it ought not to be difficult to perceive that it is very necessary indeed to use apparatus for hardening and annealing that are capable of close regulation of the temperature. And there is no doubt but that gas lends itself to such regulation. It is undoubtedly true that it is possible to design, build and operate a gas-heating apparatus which shall be more responsive to control than are apparatus dependent upon coal or oil.

There is still another matter which needs consideration in connection with the heating of steel, a matter which may very well impose varying demands upon the design of apparatus, in accordance with the duty to which the steel is to be put when it goes into service. I refer now to the matter of protection against the gases of combustion. This requires perhaps some explanation. This term "gases of combustion" is perhaps a trifle loose. At the same time, it conveniently designates the gases and smokes that arise from the combustion of fuel.

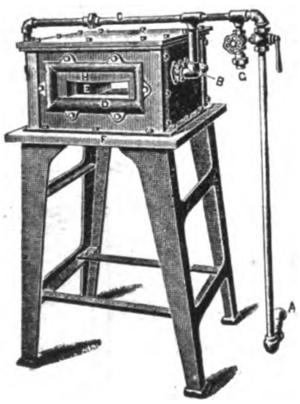

Fig. 3. Gas Forge, Without Pressure, Air Supply. Made by American Gas Furnace Co.

The air, which feeds the fire, supplies oxygen, nitrogen and carbon dioxide; while the fuel supplies carbon and other substances. The nitrogen may be ruled out as having no effect beyond that of an innocent adulterant. In the gases of combustion may be oxygen, hydrogen, sulphur, phosphorus, carbon, etc. Where a bare flame is used to heat steel, the metal is more or less exposed to the action of these substances. Sometimes, this action will make a great difference. Sometimes, it will be a matter of no moment.

Oxygen unites with iron and probably also the carbon in heated steel. The iron is converted into an oxide and this constitutes what is callled *scale*. If the heat is high enough and the carbon is really converted into an oxide of carbon (CO and CO^2), then we have probably "burnt" the steel and irrevocably ruined it. Omitting this last phase as too unlikey to occur, we nevertheless have to set down oxygen as a producer of scale.

Carbon affects steel from about 1500° F. up. That is, it enters into the constitution of the steel with the result of increasing the carbon content. This means that the outside skin is converted into a steel of a higher carbon percentage. In fact, the process known as "case-hardening" operates upon this basis. The steel is heated in the presence of a suitable source of carbon and the external layer is made into a steel of a higher carbon content. When work thus impregnated on the surface with carbon is dropped into the water, while the temperature is still fairly high the outside shell is hardened.

Usually, the case hardening process is rather a slow one, and the amount of carbon introduced per minute or even per hour may not be considerable. However, if a fair amount of carbon is not wanted as an addition to what is already there and the work is to remain for some considerable time in the forge or furnace, then the carbon in the gases of combustion may become important. Otherwise, I am inclined to think this source of contamination or damage to be small, and to say that the repair shop might disregard it.

Sulphur Is Objectionable

Sulphur can hardly be disregarded. There are certain special varieties of soft coal that contain only small or negligible percentages of sulphur; but ordinarily, soft coal contains plenty of sulphur. Conversion into coke does not eliminate it; but it usually reduces it. But the sulphur that does not remain in the coal when in the form of coke has probably gone, partially at least, into the gas made from the coal.

In short, we can hardly expect city gas to be free from sulphur. Consequently, in order to get rid of the bad effects of exposing heated steel to sulphur, one will need to provide against such exposure. Let me quote here an authority on iron and steel, Dr. Bradley Stoughton, at one time adjunct professor in the School of Mines, Columbia University. After noting that steel should always contain about four times as much manganese as sulphur in order to insure the sulphur being all in the form of manganese sulphide, and after some other remarks, he says: "The bulk of the sulphur not united with the manganese will be found in the form of iron sulphide, (FeS). This iron sulphide is more brittle than manganese sulphide, and instead of coalescing in drops, it spreads out in webs or sheets. It is therefore very weakening to the steel, because the area of weakness is more extensive than the tiny spots of manganese sul-

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phide. Steel containing iron sulphide is liable to show poor tensile strength and low ductility."

Here we have a very valuable explanation, amounting to a warning. In brief, it indicates that the effect of heated steel being exposed to sulphur in the gases of combustion is to weaken it. The remedy for the shop is to adopt some protective means, or to use apparatus which affords protection. The shop can not very well rectify matters by getting the sulphur out of the gas; so that it must fall back upon using protective means.

The Muffle

That is, the work may sometimes be inclosed by a *muffle*. When this procedure is applicable, the work—or, the heated part of it—is screened from the gases of combustion. They may play on the muffle and then pass out the flue.

There are a number of concerns which specialize on small equipment operated by gas. Amongst these are the Anchor Tool & Supply Co., Inc., 26 John Street, New York, and the U. S. Gas Furnace Co., 46 Clifford St., Providence, R. I.

Where small pieces need to be heated for welding or forging, a bench forge may be considered. The first mentioned concern supplies a gas-operated, bench forge in two sizes. Both require a gas supply and also an air supply that is under pressure. If no source of pressure-air is available, a blower is required. Then, there is a line of forges designed to cover a varying set of special requirements; and also a line of more or less standard styles. In general, pressure-air is required. That is, air under pressure is mixed with the gas in suitable proportion prior to combustion at the burner or burners. This is, without doubt, a splendid means of getting effective results. It is, in fact, claimed that the bench forge can be brought up to a forging heat from a cold condition in the space of two minutes. The other concern supplies a bench forge in one size. The heating space runs all the way through; but, by means of a plug, the rear may be closed when desired. All the foregoing forges expose the work more or less to the bare flame.

Oven Furnaces

A line of what may be called *oven furnaces* is supplied by the Anchor Tool & Supply Co., Inc. In these furnaces, there is protection against contact with combustion gases. The burners are beneath a slab which serves as the floor of the heating chamber. The work is thus cut off from the direct action of the flame. There are various sizes, so that a shop may readily have a choice. Even a small oven furnace may be obtained with a counter-weighted, sliding door; or, when preferred, a furnace with the regulation hinged door.

This same concern supplies a valuable accessory for use with their oven furnaces, this accessory being in the shape of an automatic means of controlling the temperature inside the heating chamber. It is claimed that the apparatus may be set to a selected temperature and that then the temperature will be maintained within 5 degrees, above and below, of the thermal level chosen. This control device is not a big, costly affair, but a moderate-sized piece of equipment. The advantage of this controller should be fairly clear to the reader who has absorbed the analysis of the heating problem presented in the preceding portions of this article. A blower is required for these oven furnaces, or else some source of pressure air.

Where a good deal of work has to be done, a pair of twin oven-furnaces may be operated simultaneously. While the one heating chamber is being emptied and then charged with fresh work, the other is performing its duty of heating up its own charge.

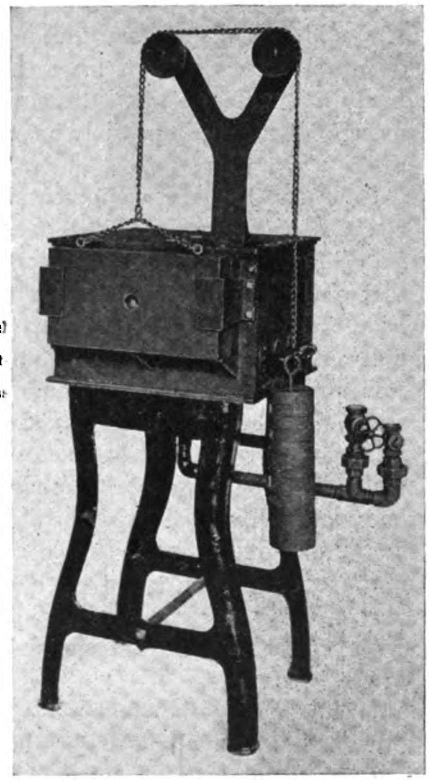

Fig. 4. High-Speed Steel Oven Furnace, Gas Operated. Made By U. S. Gas Furnace Co.

The pressure air required does not demand a compressor for its production; although air from a compressor may be used, provided a suitable reducing valve is employed. This would involve some loss, but where a compressor is already in service, it may seem economical to use some of its air rather than install a blower. The Anchor people supply a type of blower that produces the pressures required for their furnaces. In a way these pressure blowers occupy a position intermediate between a low pressure blower and the usual compressor.

LOOSE DRIVING MEMBERS

By R. L. Prindle

When the car bucks at low car speeds the trouble is very likely caused by excessive play between the driving pinion gears in the rear axle or between the two high speed gears in the transmission. To determine this, remove the front floor boards and try turning the propeller shaft by hand to see the extent of this play. If the play is more than one-half inch it is too much and the cause should be found and corrected so as to avoid damage to the power transmitting parts.

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The Auto Headlight Law

Motorists Can Improve Lights and Comply with the Law at the Same Time

IT does not seem to be generally known that the modern headlight laws are exactly as emphatic in their demand for adequate driving light as they are in demanding that dangerous glare be eliminated. The reason is very plain. It would be unjust to say that a motorist should protect others at the expense of his own safety. But it is perfectly reasonable to say, "Protect yourself *and* those you meet." No one can possibly have any objection to doing that.

Improper lighting equipment has been the cause of countless accidents on the streets and roads in every state. The blame has usually been laid on headlights that glared, while the facts are that fully half of them have been due to someone not having enough light to enable him to see where he was going. Even if someone else was throwing an unusual amount of light into his eyes at the time the accident occurred, that was no excuse for him because if a driver has plenty of light on the road he will not be endangered by other people's lights. Anybody knows that a lighted headlight does not bother him in the day-time for the simple reason that the sunlight illuminates the road so strongly that he can see it anyway. Any headlight properly equipped and adjusted, will protect the driver against the glaring lights he meets.

Unfortunately the public has gained the wrong impression that complying with a headlight law meant giving up the comfort and safety that go with good driving lights. The facts are that motorists who have complied with the laws intelligently find that they have better driving light than they ever had before and that their own glare is stopped too.

Several Methods

There are several methods of complying with the laws. One is to paint the top half of the glass as some car makers are doing, and then point the headlights and focus the bulbs properly so that the light is thrown below the level of the headlamps. However, this has much the same effect on the light as drawing a curtain halfway down has on the light that comes through a window. Half of the light never gets out of the headlights. It is absolutely wasted. It is legal in the same way that one-half per cent beer is legal—that is it gets by the law, but it is far from ideal and very inefficient: With this method it is absolutely necessary to paint at least half of the headlight glass and also focus the bulbs properly or the only effect will be to spoil the driving light and legality will not be secured. The law does not require you to spoil your light. It permits you to have even better light on the road than you could get with plain glass, providing you do not let your lights bother other people.

Some cars are equipped with tilting headlights. These in themselves do not comply with the law—unless they are permanently adjusted to throw the light downward at such a sharp angle that the bright rays are kept below them, and in this case it is doubtful whether they can throw light far enough to show the road for the required 200 feet, let alone the four or five hundred feet that you should be able to see.

Dimmers Not Always Legal

Neither does the use of dimmers comply with the law, for a dimmed light is certainly not a safe driving light. In fact the dimming of lights is generally prohibited except on well lighted streets where you can see for about a block ahead without any light of your own. Dimming the lights on a country road is positively dangerous even if the driver you meet dims his lights too—for then you are both as bad off as if you had both let your lights glare. Neither of you can see the road while you pass and if there is an accident one is as much to blame as the other.

Lenses of the diffusing type which scatter the light up, down, and sideways, can not comply with the law. Many motorists whose cars are equipped with this type of lenses fancy that so long as they have some kind of lenses they are complying with the laws. But the law says that you must have a certain kind of light; and diffusing lenses can not give light that is strong enough for safe driving without giving the most unpleasant kind of a glare.

There is plenty of choice among devices that will give legal light. Of course, with any such device the bulbs must be focused for the particular device that is used and the headlights must be pointed either horizontally or with a slight tilt downward as the particular device requires. Also there is a limit to the candlepower of bulbs that may be used and this limit is set by the official tests made by state authority.

A Wide Difference in Lights

Furthermore there is a wide difference in the road-lighting ability of the various devices that are legal. Some of them, like the painted headlight glass, give just enough light to get by the law. Others improve the light on the road in a really remarkable way by distributing it efficiently instead of merely bending it down and fanning it out sideways.

Therefore the motorist who wishes to gain the advantage of better light than a homemade makeshift will give him should choose his headlight equipment with the

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same calm judgment that he would use in buying any other accessory. There is no excuse for equipping a fifty-mile-an-hour car with twenty-mile-an-hour light.

The law does not require the use of special lenses—but the motorist who prefers to have better light than he could get without them should be careful to pick out a make that gives better light than the painted glass or his money will be wasted. Don't buy lenses for ornaments.

Merely putting lenses in the headlights will not get by the law. Each lens requires its own special adjustment of the bulb, and an adjustment which would be right for one make would not be right for another. The focusing of bulbs is simple and is fully described in instruction sheets furnished by the makers.

The idea of the law is to improve the light, not spoil it.

USE AND CARE OF TOOLS

How To Use A Hack Saw

The one thing that makes for good cutting is the choice of a hack-saw blade of the proper kind for the work. For cutting cold-rolled, solid stock, machine and light structural steels, 14 teeth to the inch is recommended, and 18 teeth to the inch for general all around work. For sheet metal and pipe over 18 gauge, 24 teeth to the inch should be used. The 32 teeth to the inch blade is adapted to either thin sheet metal or tubing under 18 gauge in thickness. It is safe to say that the 18 teeth to the inch blade is the desirable one for all general processes. The best results are obtained from 50 to 60 strokes a minute, pressing heavily on the forward stroke and lightly on the return. Don't start a new saw in an old cut, because the set is wider on the new saw and the blade will stick.

How To Use A Glass-cutter

Dip the wheel in kerosene or turpentine. Place the cutter between the first and second fingers. Start the wheel on far side of sheet of glass from you, 1/8" from the far edge. Hold cutter erect so the wheel will revolve easily and will make a straight, even stroke. Press hard enough to make a fine hair-line on the glass. If you press too hard, the glass will flake; this is wrong. Draw the wheel entirely across the glass (allowing your cutting wheel to drop off the pane). To break the glass, hold the pane firmly between the first finger and thumb, with both hands (side nearest to you) then give the glass a slight bend and it will break the entire length.

How To Use Tinners' Snips

Always make straight up and down cuts. When cutting, never twist the snip sidewise as this practice would have a tendency to dull the cutting blades. Never use blades for prying or bending and don't use for heavier work than ordinarily intended for their size. The joint and cutting edges should be kept well oiled. Another point to remember is never to use the cutting edges for wire cutters.

Before putting tools away, there is much to be gained by oiling the tools—'most any kind of oil will do. Nothing dulls the temper of tools more than rust, and by using a little foresight there is much to be gained in this way. Treat tools right. Never abuse a screw driver by using it for a cold chisel, or a wrench for a hammer. You owe it to yourself to give tools reasonably good care, and they will live up to the claims the manufacturers make for them.

Pliers

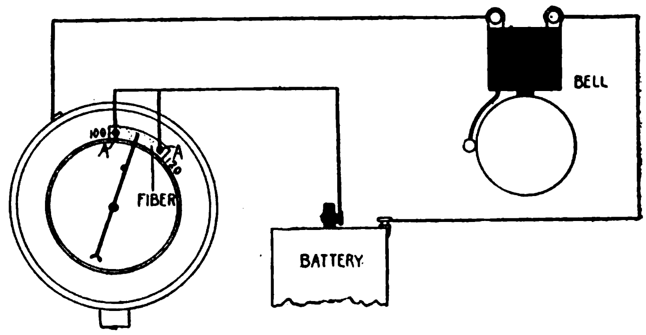
To get the best results from a pair of pliers, keep the joint well oiled. To get correct leverage, grasp the plier handles well away from the joint.

(Reproduced by Courtesy of Smith and Hemenway Co., Inc., Irvington, N. J.)

A SIGNAL FOR THE AIR COMPRESSOR

By R. L. Prindle

It is a very simple matter to rig up a device to cause an alarm to ring when the pressure in the air tank reaches the desired maximum or minimum, thus warning the man in charge that the air compressor should be turned off or on as the case may be. The indicating hand on the pressure gauge at the left completes a circuit by



touching a metal pin when it moves to either extreme, and this causes the bell to ring.

These pins are mounted on a small fibre block, which in turn is riveted to the face of the gauge. In this way the pins are completely insulated from the gauge, and are connected to one terminal of the bell. A short length of wire will run from the other terminal to the battery and the return wire is attached to the casing of the gauge, so that current flows through the casing and the hand moves to one or the other of these metal pins.

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New and Useful Automobile Accessories

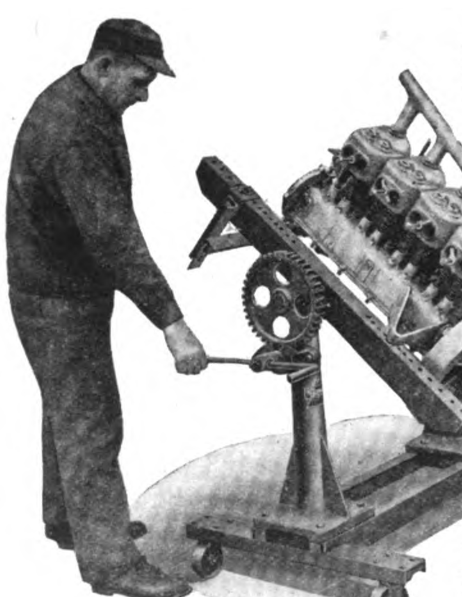
The Manley Motor Stand

Would you stand on your head to repair an automobile top? This seems a foolish question with but one answer, yet many repair men repair engines under difficulties similar to the one inferred in our question. It takes nearly twice as long for the workman to do a repair job, lying on his back under the car as it would if the work could be done by the workman in a natural position. The same is true concerning the engine and the repair shop owner is literally forcing his men to work upside down if the shop is not equipped with an engine stand.

The engine stand illustrated, made by the Manley Mfg. Co. of York, Pa., is so arranged that any kind of engine may be mounted upon it. The width of the supports is governed by the position of the supporting posts which may be moved as desired. A cross-piece for three-point suspension engines is provided.

Once the engine is in place the matter of turning it over is an easy one; the large gear reduction reduces the effort. The gears are provided with a safety guard and a latch which engages the pinion and locks the cross-arm at any position. The other side of the stand, or rather the other upright, is provided with a rigid brace which prevents back-lash and holds the engine in position rigidly.

As will be seen from the illustration, the stand is provided with wheels so that it may be moved from place to place with the engine mounted upon it. This feature is valuable in a shop which is not equipped with a crane.



No-Float Carburetors

The Health Products Corp. of Detroit, Michigan, are the manufacturers of No-Float Carburetors which are being widely used.

Jefferson Steel Wheel

The Jefferson Forge Products Company, Detroit, Michigan, announces a Passenger car wheel of entirely new construction; a drop forged steel wheel of one piece of solid metal—hub, brake drum, spokes, and felloe. There are no bolts, nuts, rivets, welds or joined sections.

Jefferson Drop Forged Steel Wheels are the result of co-ordinating two positively new principles of wheel making—drop forging and unit construction. The Jefferson Drop Forged Steel Wheel is a real wheel—ten spoked—and of exceedingly graceful design.

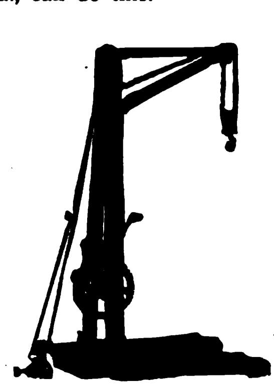
Rigid tests have shown that it possesses great strength for passenger car service. It is not affected by extreme climatic influences; nor are there numerous parts to loosen, erode, break, cause annoyances or become dangerous.

There is a distinct elasticity to drop forged steel—in the manner in which it is utilized in the construction of the Jefferson one piece wheel—that assures the maximum of safety in the event of unusual side thrusts or the severest road impacts.

The Manley Two-Ton Crane

The garage owner who provides his men with modern machinery is fairly sure that he will obtain maximum returns from his investment. If he relies upon his men for all kinds of work, then he is robbing himself, his men cannot be horses and still do skilled hand work. The time that they spend lifting heavy parts is taken away from their regular work.

If a machine can do the work of several men, then the machine is valuable and the two-ton crane made by the Manley Mfg. Co., of York, Pa., can do this.



This crane has a lift of seven feet and is equipped with wheels so that an engine, a heavy part, or even a complete automobile may be carried by it. The chain lift is of special construction and carried over a drum at the bottom. Through a gear reduction the lift is greatly reduced. A locking device, acting upon the gears, prevents the weight from dropping, once it has been lifted. The front wheel is provided with a stop action so that it may be locked in any position.

Clamert Renewable Chains

A broken tire or weed chain usually cracks the heart of the motorist when he hears the snap, snap of the broken ends beating against the nicely painted fenders of his car. Those who appreciate this fact will be interested in the product of the Clamert Mfg. Co. of Latrobe, Pa., which is bringing out a renewable chain.

The Clamert renewable chain is made in sections and the cross pieces can be removed and replaced in a moment without the use of tools. When a cross chain breaks, as it often does, through ordinary wear, if it is a Clamert it can be taken off and a new one put on with a minimum amount of delay.

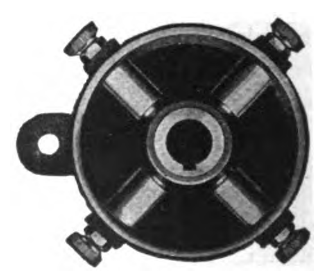
The Clamert chains are heavily brass plated on the cross members while the side chains are galvanized. These chains are made in all standard sizes and extra cross chains may be purchased at an extremely low figure.

Our readers may be interested in knowing that the Clamert cross chains can be used for replacing the broken cross chains on most any kind of tire chain, regardless of make.

The New Daleco Timer for Ford Cars

For several months past the Dale Manufacturing Co. have been quietly putting on the market the Daleco Timer thus proving its quality by practical service under all conditions.

The outstanding features of the Daleco are a Bakelite case of evidently strong design, a true circular motor of specially made fibre with a copper insert contact, and all brass and copper electrical circuit.



The distribution units are set radically in the case and timing is said to be in no way affected by either wobble or endwise movement of the timer shaft. No lubrication is required and should grease or oil, working through the cam shaft bearing, cover the rotor, the oil film is instantly broken by the wipe contact and starting assured no matter how cold the weather.

The material and construction is the best and the entire product is made to appeal to the requirements of those who want "a better timer."

After November 1st next, distribution to the trade will be through the Zinke Company of 1321 Michigan Ave., who will act as the sales department for the Dale Manufacturing Co.

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The Topsy Turvy Auto Repair Rack

We illustrate herewith a device which is both unique and interesting, an automobile rack which is designed for tipping a complete automobile upon its side, thus exposing all parts of the car at the convenience of the workman.

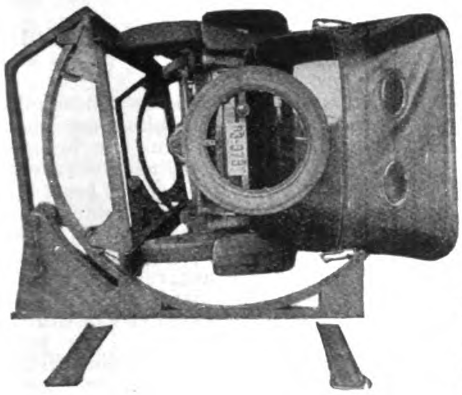
It is generally conceded that the engine stand, with its tipping features, is a valuable machine; it follows, then, that this automobile repair rack is of even greater utility to the service station.

The device illustrated, the Topsy-Turvy repair rack, is made by the Kenosha Boiler

& Structural Co., of 312 S. Clark St., Chicago, Ill. It measures 14 feet 4 inches in length and takes up a floor space of 7 feet 6 inches in width. The channel iron runs for the wheels are regular 56-inch gauge to suit standard cars.

The car is run onto the rack up two inclined runways which are then removed and the car clamped to the tracks through its wheels and a pair of turnbuckles attached to relieve the springs of the strain. The car may then be tipped to right angles with the floor and the mechanics can make the adjustments in a natural position.

The tipping action is through drums and cables and as the revolving units are mounted on wheels, is not difficult.



New Heald Publication

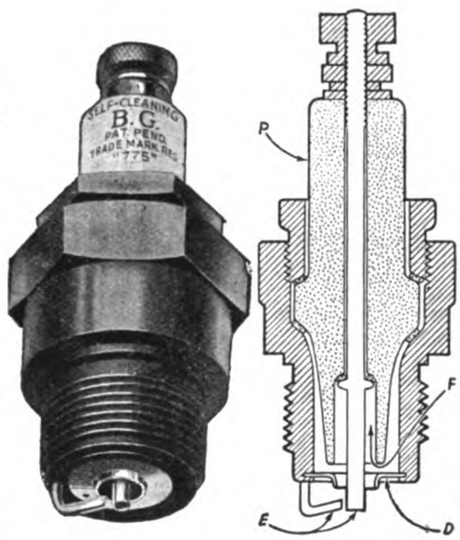
The Heald Machine Company of Worcester, Mass., has recently brought out a very interesting and instructive book on cylinder regrinding. This book thoroughly covers the field, and considers the question not only from the standpoint of the advantages in regrinding and the proper equipment to use, but also treats on the problems which are certain to come up with every concern going into this business.

B. G. Automobile Plug

Just as the remarkable performance of thousands of B. G. Plugs in daily use by the United States Government has established the B. G. Plug as a leader in the aviation field, so now the new B. G. Automobile Plug, made by the B. G. Corporation, 33 Gold St., New York City, is making a record for itself in the automobile industry.

The B. G. Spark Plug—known as "the plug that cleans itself"—is guaranteed against failure from carbon and against fouling by oil. These features are said not only to eliminate that bugaboo of the motorist—that frequent cleaning of spark plugs—but also to insure complete ignition at all times and maximum power and gas mileage.

As shown in the illustration and sectional view herewith, a special feature of the B. G. Plug is the little "hot-spot" monel metal disk. This disk "D" heats instantaneously and remains hot. Together with the electrodes "E" and the porcelain "P" it is at a temperature that conditions the fuel at the sparking points and within the plug, by breaking up the globules of oil and gasoline into a freely burning vapor.



Consequently, when ignition occurs, the vapor inside the plug (which serves as a primary cumbustion chamber) not only burns cleanly, elaving no carbon, but projects a flash of fire into the cylinder. This shotgun flash scours the firing points and compels complete ignition.

The complete conditioning of all fuel and oil in and about the plug, combined with the shot-gun method of producing combustion, is said, absolutely prevents all carbonization of the insulator and sparking points.

In cold weather, the B. G. disk heats up with the first few explosions, forming a "hot-spot" which allows a cold motor to run evenly and develop full power almost instantaneously.

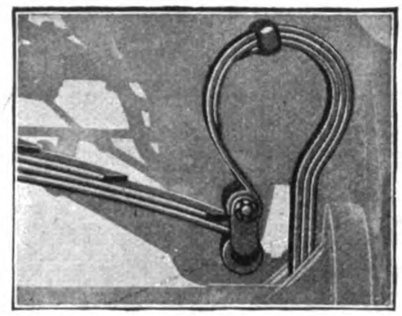
The B. G. Spark Plug is made with carefully selected and tested nickel manganese electrodes that will not burn or pit. The insulator is a carefully designed unit of Frenchtown "775" porcelain guaranteed not to crack from heat. The shells and coupling nuts are made from a low carbon steel, tempered for toughness. The compression gaskets are unusually durable, made from a selected stock.

New Ford Shock Absorber

"Grey Goose" is the name selected by the Indiana Parts Co. of Richmond, Indiana, for their new Ford shock absorber. The name is suggested by the goose-neck design of the accessory.

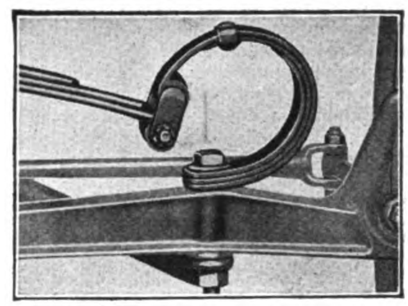
The Grey Goose shock absorber is made in two types, one for front Ford spring and one for the rear. The action is the same; the difference of design is for the purpose of fitting.

Leaf-spring construction is used, the material being chrome vanadium steel, and the design is said to allow free action of



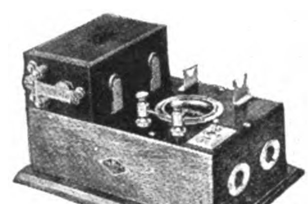
the springs while damping and checking the rebound. The eyes are bushed, reamed and drilled for oil cups.

The set of four Grey Goose shock absorbers can be applied by anyone in from forty-five minutes to an hour, the necessary tool being a monkey wrench. Salesmen and distributors are now being appointed for territory not already covered.



The B-W Tester

An instrument for testing Ford coil units, single and double contact lamps and spark plugs has recently been placed on the mar-



ket by the B-W Electric Co., 7421 Manchester Ave., St. Louis, Mo. It is called the B-W tester.

It is not necessary to have a knowledge of electricity in order to properly use the B-W tester. Full instruction is furnished with each instrument.

The device is made in two types, one for direct and one for alternating current.

This well built, compact instrument is well worth investigating by readers of the Automobile Dealer & Repairer.

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The Autolog

The Autolog is a handsomely nickel-plated disc instrument only two and a half inches in diameter, that fits on the spoke of any automobile steering wheel. Every time gas or oil is taken on, the Autolog is directly in front of the driver where he cannot forget to mark down the quantity through the pencil opening under the current date.

On the back of the Autolog record card are spaces to insert the speedometer mileage reading on the first and last day of

each month, the total gas and oil supply for the month and the mileage per gallon of gas and per quart of oil. Each one of the twelve monthly cards (a year's supply) furnished with every instrument will show a complete month's record. By keeping the filled-in cards in the handy container provided, the car owner has an accurate month-to-month record what his car is doing in these important respects.

The Autolog is simple in construction and it is only necessary to tighten a couple of nuts to clamp it permanently on the steering wheel. To insert a new card a thumb-nut is taken off.

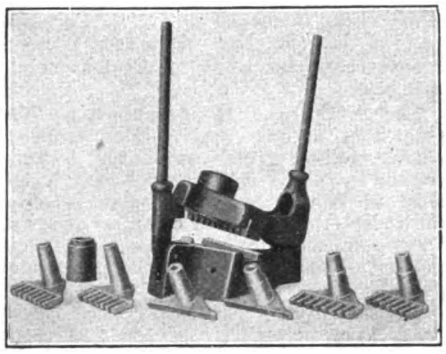
The device is manufactured by the Autolog Company, 1144 South Hope St., Los Angeles, Cal.

New Washburn Battery Molds

The Washburn Burner Corporation of Kokomo, Indiana, announced their new battery molds which are especially constructed for use by the storage battery repairmen. It is claimed that these molds have made it possible for the repairmen to manufacture 90% of the lead parts used on standard storage batteries at a minimum cost.

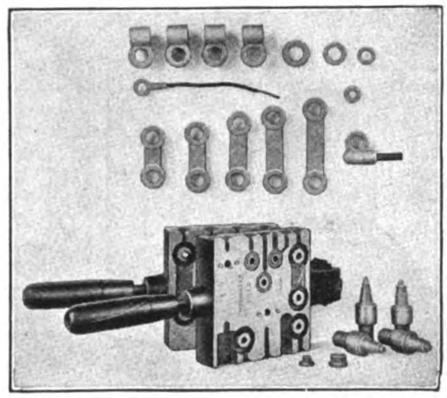
No. 1—It is claimed that this mold is constructed in such a way as to enable the operator to cast three posts per minute. Castings easily removed. The removable tooth rack enables the operator to cast odd and even number teeth on post strap to receive plates, correctly spaced for all standard batteries. By reversing ends, one is enabled to cast blanks when custom requires. Two bushings are furnished which are bored and reamed to standard post sizes, fitting standard rubber covers commonly used by all repair shops.

No. 2—It it claimed that this mold is constructed so that it will not overheat where speed is required. Casts five of the most used connectors for all batteries, using Standard Jars 7—9—11—13—15 Plate, 4 end connectors (2 Dodge Tapers and 2 Standard Tapers, Negative and Positive), 1 end connector, 3/8 inch lead used on 12 volt Maxwell and all



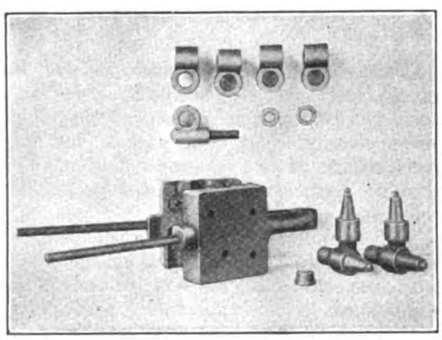
other cars using a wire lead, 1 small wire lead to connect with end post on storage battery requiring direct connections.

Two Post support rings fit the two sizes standard rubber covers; also fit perfectly all posts cast with our post



mold. Two handy washers sometimes badly needed when installing a new or rent battery.

No. 3—"B"—This mold casts end connectors including cable lead and 2 washers.



Clark-Turner Announcement

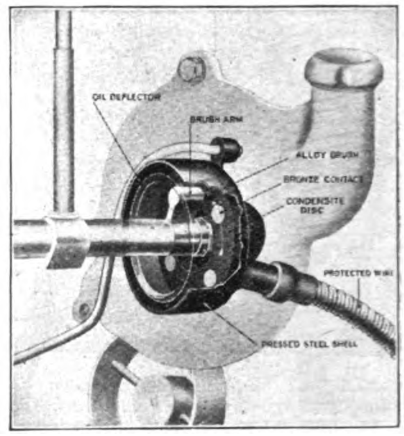
The Clark-Turner Piston Company of Los Angeles, California, manufacturers of the famous Deluxe Light Weight Cast Iron Pistons, announce that they can now furnish their Deluxe Pistons for over twelve hundred automobiles, trucks, tractors, motor cycles, motor boats and aeroplanes. This piston is made for more different makes of motors than any other replacement piston on the market today.

The Clark-Turner Company is adding new models to its stock almost daily,

Big "T" Timer

The Big "T" Timer for Fords and Fordsons, manufactured by The Fortime Products Company, Warren, Ohio, is arranged like a distributor and should embody the same reliability and permanence. The accompanying cut shows the general design.

The heavy pressed steel shell is water tight, solid and indestructible. A thick condensite disc with bronze contacts moulded in place, is bolted to the shell, thus forming a single unit of shell, wire, conduit, and terminals, ready for installa-



tion. The deflector prevents any oil from working into the timer from the cam shaft bearing at the rear; and the flexible metal conduit and rubber ferrule will exclude all water, oil, and dirt from the front. These preventatives assure freedom from short circuits and foul contacts. A compression spring lightly holds the special alloy brush in contact with the disc.

The manufacturers of the Big "Tim" Timer guarantee their product to give entire satisfaction. It is their claim that the improved design enables a Ford to start easier; to be throttled lower; and to run more smoothly and economically and to do these things permanently.

Piston Pins Packed in a Way to Aid Retailers

A new method of packing piston pins has been devised by a leading manufacturer whereby a set of pins can be sold by the leader without splitting a carton. This method is to pack a set of four, six, or eight piston pins in an individual carton according to the number and make of car for which the pins are intended. A four cylinder car, accordingly, can be fitted out with new piston pins from a carton of four, a six cylinder car from a carton of six, and so on. Each individual carton is marked according to the contents, and a number of cartons are packed in a larger carton for the convenience of the jobber. Each pin in the carton is painted upon one end to indicate size—green for standard size, yellow for .003 oversize, red for .005 oversize, blue for .010 oversize and white for all odd sizes. The value of this method of marking can easily be appreciated.

The manufacturers using this system can furnish pins in standard sizes and over-sizes for any make of pleasure car and for trucks using Continental Motors. These manufacturers are the well-known Burgess-Norton Mfg. Co., of Geneva, Ill.

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FIELD SERVICE AND ITS RELATION TO THE AUTOMOTIVE INDUSTRY

(Continued from page 35)

remove it from the band and replace it with another type or size. The machine is operated by foot lever which allows the operator both hands in adjusting and holding the lining in the brake band. This is a convenient tool and is vastly superior to the old time method of hammer and chisel. The time for lining a 22-hole band with this machine is given as approximately 7 minutes.

Radiator Test Stands

This stand consists of a tank used for testing radiators under pressure. The tank is made of galvanized metal with a heavy bottom. One stand on the market is equipped with an air pressure gauge combined with a pressure reducing valve, which automatically reduces any air pressure low enough to do away with any degree of excessive pressure being applied to the radiator. The stand is also used for testing inner tubes, etc.

Piston Vices and Press

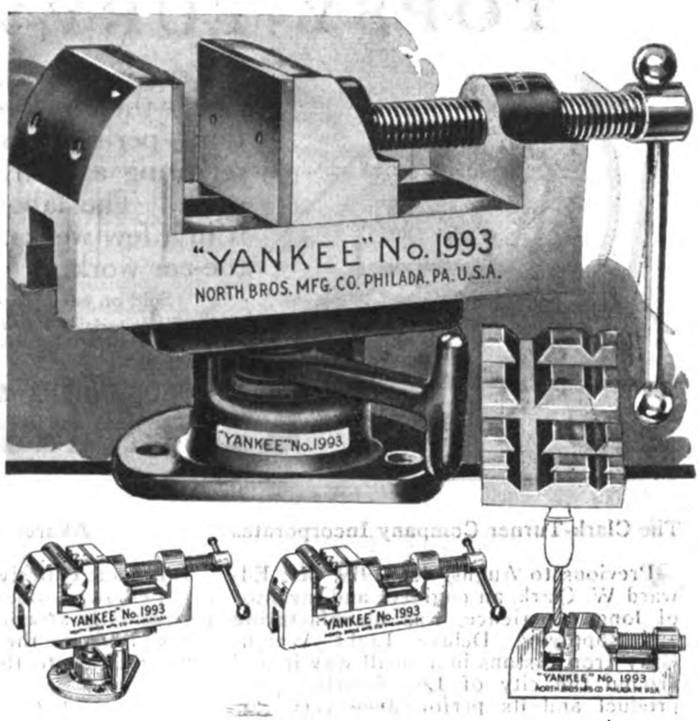
Every garage repair department knows that it is very difficult to hold a piston without some kind of mechanical equipment so that work can be done on it. There are many of these fixtures that hold the pistons during any operation, such as reaming piston pin bushings, lapping and fitting rings, etc.

Wash Tanks

Motor blocks when taken from the chassis are generally very dirty. A wash tank is especially convenient for washing motors, axles, and miscellaneous parts and by means of a chain hoist or crane the entire motor can be submerged in the tanks. With the tank filled with wash solution one tank on the market takes about one-half hour to heat the liquid to boiling point. A wire basket is furnished for holding small parts while they are submerged in the tank for cleaning purposes.

This brief description of some garage repair equipment shows that there has been some engineering thought given to this part of automotive work, but when we make an analysis of the garages that are doing repair work, throughout the United States, and find so many poorly equipped, it shows the possibilities for future progress.

There are many things that affect the proper operation of an automobile and unfortunately a purchaser or user cannot appreciate what it means to analyze automobile troubles, and the time that is necessary to determine just what must be done. A proper service station, however, should be capable of analyzing these troubles quickly and the result of this investigation presented to the car owner. It should further be possible to give the car owner definite prices for taking care of the different repair operations found necessary. With this kind of co-operation the service garages will have no chance of failure, and the car owner satisfied that the field service of the automotive industry is handled in a business-like way.



This is the vise that makes accurate work possible

"YANKEE" VISES

With Swivel Base

No. 1994—Body 10 1/2 in. long; 4 in. wide. Jaws open 4 in.; depth 2 1/8 in.

No. 1993—Body 7 1/4 in. long; 2 3/4 in. wide. Jaws open 3 1/8 in.; depth 1 7/8 in.

No. 1992—Body 4 7/8 in. long; 2 in. wide. Jaws open 1 7/8 in.; depth 1 1/4 in.

No. 1991—Body 3 5/8 in. long; 1 1/2 in. wide. Jaws open 1 1/2 in.; depth 7/8 in.

Without Swivel Base

As above: Nos. 994, 993, 992, 991.

Lock the work in the vise. You don't have to remove it 'till the entire job is completed. To carry the work from machine to machine, remove the vise with the work in it, from its base. This means speed as well as accuracy.

No matter how you place the "Yankee" on a machine, perfect alignment is assured because bottom, sides and ends are machined true. This vise can be used as a jig.

Vise is quickly detachable from base by turning a set screw. Vise can be locked in any desired position on the base. Hardened steel block with V-shaped grooves holds round or irregular work.

Dealers everywhere sell "Yankee" Tools.

This helpful book FREE

Contains numerous illustrations Actual photographs that are a revelation of what you can do with these remarkable tools. Mailed upon request.

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Ratchet Tap Wrenches

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"YANKEE" TOOLS
Make Better Mechanics

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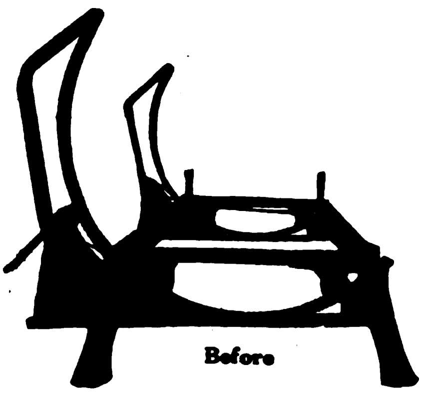
TOPSY-TURVY AUTO RACK



Before

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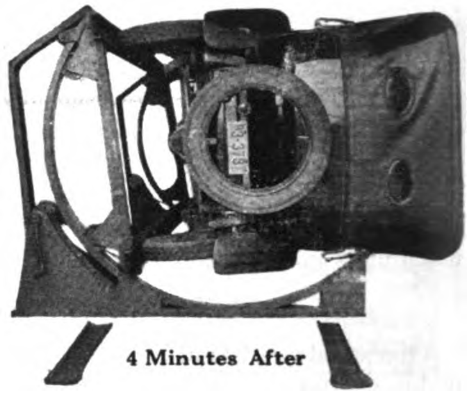

4 Minutes After

The Clark-Turner Company Incorporates

Previous to August 1st 1919, Mr. Edward W. Clark, an engineer and inventor of long experience, was manufacturing and supplying Deluxe Light Weight Gray Iron Pistons in a small way in and around the city of Los Angeles. His product and its performance very fortunately attracted the attention of Mr. Stanley S. Turner, at that time distributor for a well known automobile, and so thoroughly was Mr. Turner sold on the merits of Deluxe Pistons and their performance that he immediately disposed of his automobile business and joined Mr. Clark in the organization of the Clark-Turner Piston Company, starting August 1st 1919, as a co-partnership.

Then Deluxe Pistons were placed on the market nationally, meeting with so ready and satisfactory a response that plans were at once laid for the development of a large business. From August 1st, 1919, to June, 1921, the concern grew from a mere handful to over four hundred employees requiring during that time numerous additions to the original factory and finally being forced to purchase a site and to erect a large and modern factory and in that time also building up a tremendous demand for Deluxe Pistons a demand extending not only to every section of the United States, but to Mexico, and Canada, and many foreign countries as well.

Believing inevitably that the corporate form of organization would give a much broader scope and permit many things in the way of development not possible as a co-partnership the Clark-Turner Piston Company applied for and was granted a charter by the Secretary of State of California and therefore became incorporated in June, 1921.

The capital stock is $1,000,000.00. The officers of the Company are Mr. Edward W. Clark, President; Mr. Stanley S. Turner, Vice-President and General Manager; Mr Fred C. Galloway Secretary and Treasurer; having an active board of Directors.

The modern new factory, has a floor space of approximately 50,000 square feet with ample room for further development. Since moving into the new plant the production of Deluxe Pistons has been tremendously increased, which promises unusual service facilities to distributors, dealers and owners.

Akaret Oil Gauge

It is made entirely of metal and consists of an elbow, a tube and a measuring rod, permanently attached to the engine; the elbow replaces the lower pet cock; the tube screws into the elbow and projects

about one-half inch through the splash pan, coming out nine inches above the right-hand running board; the measuring rod is inserted in the tube; the lower end of the rod is marked Danger Low, O. K., Excess; the top O. K. mark indicates the upper pet cock level; the lower O. K. mark represents the oil level when half way between the two pet cocks; the extreme end of the rod shows the lower pet cock level of oil, this being the danger area.

To install the device cut 5/8 inch hole through apron, 9 inches above the 2 5/8 inches forward of front end of right running-board; remove lower pet cock from crank case and screw in the elbow firmly without forcing; insert plain end of tube up through hole that has been cut, and screw the lower end into elbow; replace oil in engine until it reaches the space on the gauge rule marked O. K.

This device is manufactured by the Wallace Motor Products Corporation, 465 Washington St., New York City.

The Dilut-O-Meter

In the columns of this magazine from time to time, we have warned our subscribers to change the oil in their engine crank-cases frequently because of the fact that the lubricant becomes diluted after a period of use. There is no set rule for mileage because some engines will run longer than others on the lubricant without danger.

By changing the oil frequently it may happen that good oil is discarded and to obviate this the Lubricating Appliance Mfg. Co. of 1464 East 57th St. Chicago, Ill., have produced a device called the "Larcliffe Dilut-O-Meter" which is said to indicate the amount of dilution of lubricating oil.

The Dilut-O-Meter resembles an hydrometer but the markings are different from that device. In using the Dilut-O-Meter it is placed in the oil to be tested and will sink to a certain mark. The various marks of indication are: "Good"; "Fair"; "Poor" and "Danger."

In order that the device may be used for the various oils which differ in specific gravity even when new, the dilution scale is mounted on a movable sleeve. A setting test is made with the new oil when it is first placed in the engine and at that time the scale is moved to indicate the zero, or "good" point. The sleeve is left in this position for subsequent tests when it will indicate properly.

Common Sense Valve Grinder

The Common Sense Manufacturing Company, of Hammond, Indiana, are the manufacturers of a new tool, which is known as the Common Sense Valve Grinder.

The handle is a die casting and the gears are of a special alloy. The oscillating effect is through beveled gears, which have a range of from one-eighth to two turns of the blade to each stroke of the lever.

There is an assortment of stampings, which cover all valves and these stampings are attached to the blade in such a way as to act as a universal joint, leaving the valve to seat perfectly at all times and allowing the eighth valve of the Ford to be reached under the dash. The lever folds in the handle and by removing the stamping you have a high grade screw driver.

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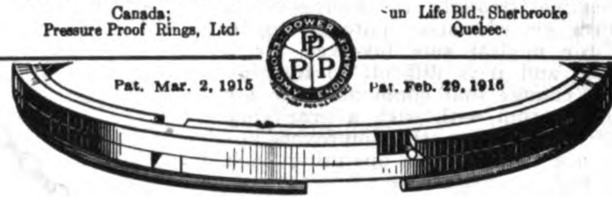
Canada; Pressure Proof Rings, Ltd. ·un Life Bld., Sherbrooke Quebec.



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Excellent territory and liberal agreement for live distributors

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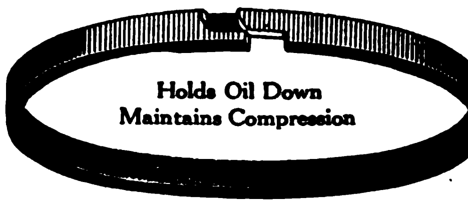

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58	25/32 to 27/32	9.00
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60	29/32 to 31/32	10.00
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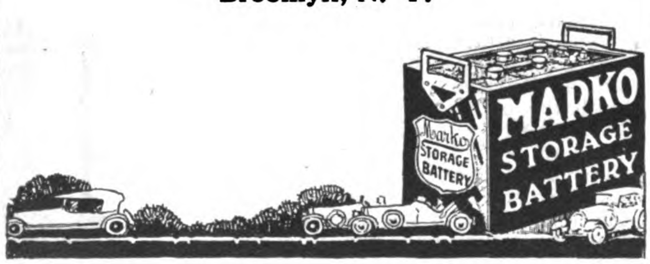

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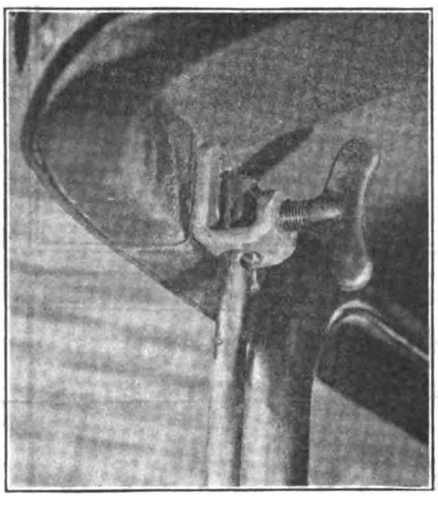
Pontiac One-Man Top Outfits for Fords

Those who are interested in top building and automobile trimming will undoubtedly be glad to know that there has been brought out a special outfit designed with a view to supplying their needs for the thousands of one-man top jobs that are being placed on Ford touring cars.

The idea of replacing the original top is appealing strongly to thousands of Fords owners who seem quite willing to spend the modest sum involved for a new top, and it is difficult to imagine any one change that could be made for so small a sum with such a gratifying result. Aside from the improved ap-appearance the ease of operating such a top needs no argument.

The American Forging & Socket Company of Pontiac, Michigan, have been experiencing such a demand for bow sockets to be used in the construction of Ford tops that they have brought out a special outfit designed for this purpose. This outfit consists of not only the bow sockets, but what is almost as important —the necessary windshield attachments to serve as a top support and hold down



clamp. These are part of the standard outfit which they are putting out.

A glance at the illustrations will make their application readily understood, but by way of description, would explain that the set comprises two principal parts which are, of course, duplicated as they have to be attached on both the right and left sides of the windshield. Each half of the set consists of an upright rod which is attached to the Ford windshield hinge (lower half) by simply removing with a screw driver the two screws used to assemble this part to the windshield frame placing the upright in position and simply replacing the screws Nothing further is required to attach this part.

The other member consists of a clamp shaped device provided with a thumb screw which is attached to the inside of the front or outrigger bow of the top by means of the large wood screws furnished with the outfit.

With these two parts in position, as described, all that is necessary is to bring down the forward bow, thus bringing the clamps attached to the bow down over the upper ends of the uprights attached to the windshield, and tightening up the thumb screws firmly holding the top in position.

The Orum Sealing Pot

S. R. M. Orum of 503 North 11th St., Philadelphia, Pa., is making a device which is of interest to every storage battery station. This device is known as the needle valve sealing pot and as the name indicates is designed for melting and applying sealing wax to a storage battery.

The old fashioned method of pouring

the wax from a ladle is both messy and cumbersome but with the needle valve sealing pot the troubles are eliminated.

The Orum pot is made of fairly heavy metal to retain the heat and once the wax has been melted it is hung over the bench where the batteries are being assembled. A slight turn of the needle valve allows a thin stream of wax to flow through the hole in the bottom of the pot and this thin stream may be guided accurately around the battery joints. The stream may be checked in an instant and is said not to drip.

By this method there is no free wax left on the outside to catch fire when the pot is heated again. The sealing pot may be obtained in two models, one for heating over a stove and the second contains a gas coil.

Battery Burning Stand

We illustrate herewith a device which should form a part of the equipment in every battery charging or service station. The group assembling rack, as it is called, is really a necessity in jobs where battery groups are to be assembled.

This stand is made by S. R. M. Orum of North Philadelphia, Pa., and consists of a base and adjustable standard. In using the device, the positive or negative plates are properly spaced and held in the stand.

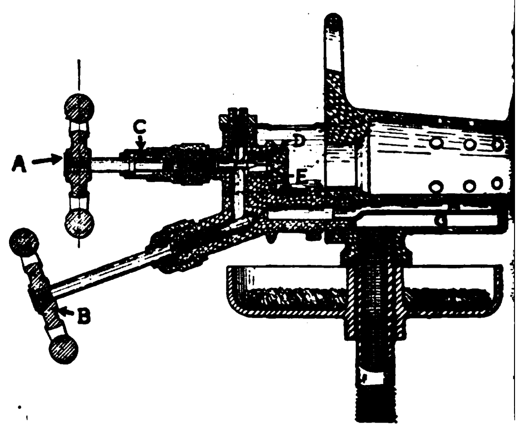
Clayton & Lambert Improved Double Needle Burner

It is a well known fact that gasoline fire-pots and blow torches, such as are commonly used by the mechanic, can be put out of service within a very short time and the burner ruined if the sharp pointed needle that controls the generator is screwed up too tight, or if by any other means, the small orifice or fuel opening in the burner is made larger. The reason for this is that the enlarged orifice in the generator allows a larger amount of gas to pass through into the combustion chamber which produces an imperfect mixture with the air, thus reducing the generating and heat producing qualities of the burner.

In fact, it is claimed by the Clayton & Lambert Mfg. Co., Detroit, Mich., who are well known makers of gasoline and kerosene fire-pots and torches, that over 60% of all burner troubles are caused by the needles that control the generator being made with sharp points and to overcome these troubles they have designed and secured patents for their new improved double blunt needle burner, a section view of which is shown below and clearly indicates the construction and improvements.

Both the needles used in the improved burner have blunt points which makes it

Old Style Sharp Pointed Needle — New C. & L. Blunt Shut Off — New C. & L. Blunt Cleaner



impossible for the user to enlarge the burner orifice. The lower needle "B" regulates the supply of gas and the upper needle "A" has a small wire top "E" that cleans the orifice in the jet block "D." The safety stop "C" prevents the upper needle from being unscrewed too far. All double needle burners are supplied with two jet blocks, one for burning gasoline, the other for kerosene. They are interchangeable and the jet block in the burner can be quickly removed and the other jet block screwed quickly into place.

The makers claim that these double needle burners have wonderful generating power, producing from 100° to 300° more heat than any other make of burner and that the consumption of fuel is reduced to the minimum, this being due to the improved construction of the burner and the extra long vaporizing chamber "G" and vein tube "H" through which the gas passes, causing it to become super-heated before entering the combustion chamber.

These improved double blunt needle burners have recently been applied to a full line of the Clayton & Lambert torches, pint, quart and two-quart capacity, Nos. 206 to 211 inclusive. They have also been adapted to their fire-pots Nos. 1, 5, 71 and 72 which have been favorable known to the trade for many years.

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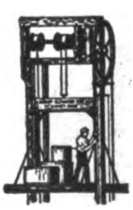

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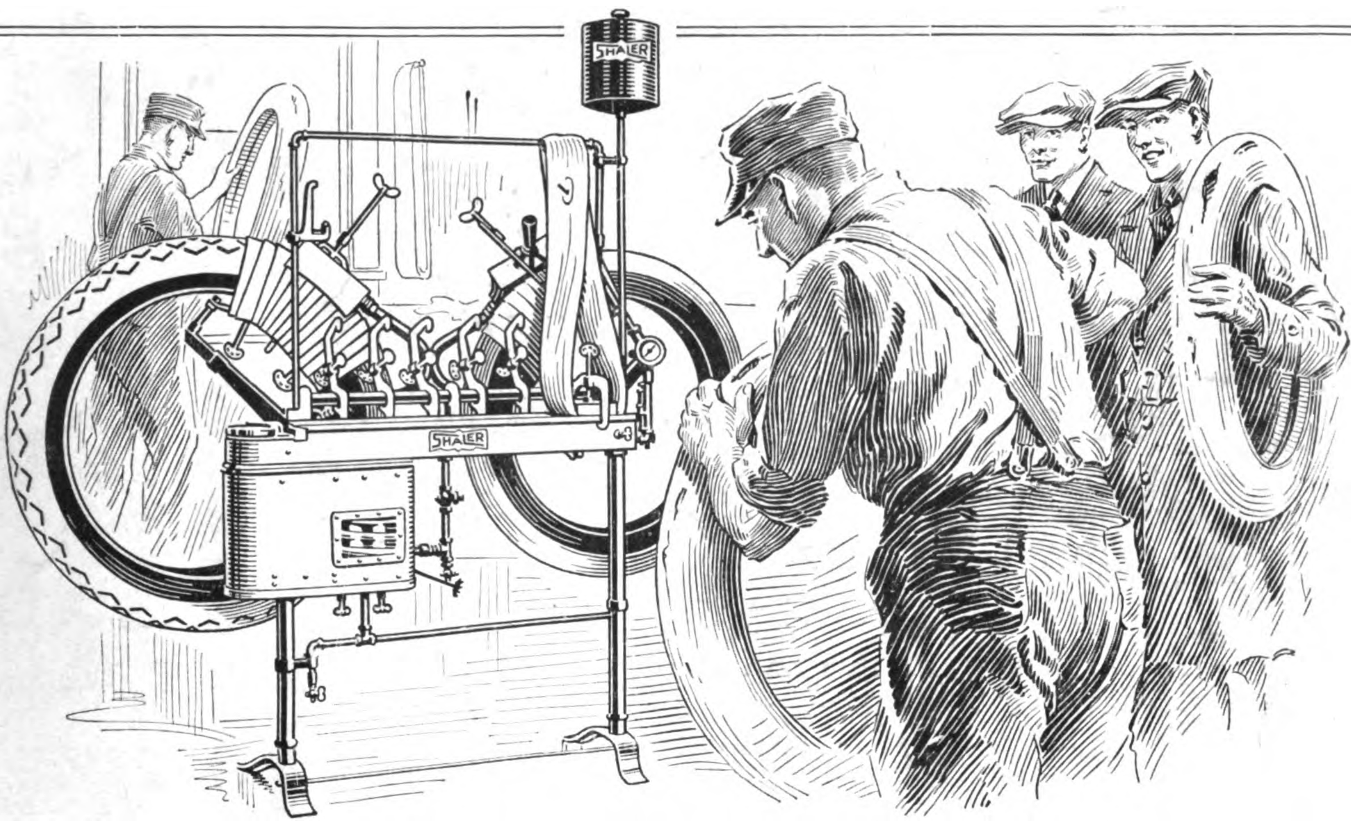

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Cow Accidents

IN SELECTING the title for this story I think that I followed the rules of the game and gave my text in the fewest words possible. After you have read my article I think you will agree that the title of "Cow Accidents" tells the whole story.

If you have ever driven through a farming country just before sun-down and encountered the female of the bovine species, either traveling alone or in the company of others, you may catch a glimmer of light upon my text. A meek faced, brown eyed, well fed, deliberate mannered cow is always a menace to the poor defenseless driver of an automobile when she is tripping along the high road. But when I said "menace" I was too conservative; no word in our language expresses the terrible potentialities of the wayside cow.

An experienced character reader might analyze the face of a cow somewhat after this order: "Forehead, low and wide, indicating lack of decision in matters of imortance. Chin, receding, thus indicating lack of incentive. Eyes, large and deep, indicating an honesty of purpose and lack of hypocrisy. General physiognomy indicates a peaceful disposition." An experienced character reader, which I am not, might make such an analysis and naturally might fill it out more completely but I think I have covered the principal points which may be of interest to us.

No Expert Needed

But it doesn't take a character expert to analyze the cow as I have in the last paragraph; one need but to drive past an unfettered cow to realize that she has all of the above qualities. Personally my advice to the motorist, when he sees a cow in the far distance, is to apply both brakes to the limit, turn his car in the opposite direction and hunt for a detour around the hazard. Should he be foolhardy enough to approach her he will find that she has but one aim in life, to put herself directly in the path of the machine and to stay there, regardless of consequences. Dead or alive she is a monument of inflexibility.

Knowing all of this we can prepare ourselves in advance and being so prepared obviate all chance of a "cow accident," speaking literally. However, the lowly cow is being used merely as a symbol of speech in this article, the application is still to come.

When we said that the cow was a menace we spoke truly but since she is so few, we need worry about her but little. The greatest menace today, on our highroads is the average cow-motorist, the automobile driver with all the characteristics of the cow, and he is legion.

You cannot take a single trip without encountering a cow-motorist, a man who may be harmless enough as a human being, but who, as a driver, is not fit to be upon the roads with decent drivers. And it is about this class of motorists that I would speak.

The Cow-Motorist

The main characteristics of the cow-motorist is his entire ignorance of all laws of automobile etiquette. His creed is that he has as much right to the road as anyone else and he openly expresses his intention to claim all of his rights, regardless of consequences. When two such cow-motorists meet, there is always an accident.

I have just completed a 500 mile week-end trip over a few of New York State roads and on this comparatively short tour I collected enough material, cow-material, if I may use the expression, to compile this article.

My first observation concerns the parking of cars. Toward the end of my trip I rather expected to find a car parked upon the narrowest place in every curve and my expectations were often realized. The person who parks his car upon a hidden corner, or in the middle of the road as is often done, does not deserve any consideration from the decent motorist.

One might consider that the motorist, out of self preservation, would be careful where he stopped, but one would be wrong for the cow-driver cares about nothing, thinks about nothing but his latest whim. Possibly he

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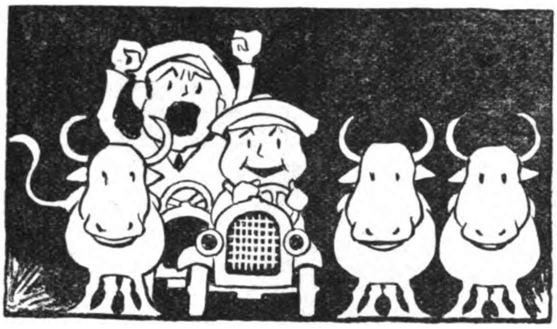
is interested in the view, maybe he is stopping for lunch, but at any rate he usually picks the narrowest part of the road and takes his share.

At one point of my trip through the mountains I was driving my machine up a very steep grade; naturally I was trying to maintain a certain amount of speed out of respect for the cars behind. At the top of the grade I turned a sharp corner to find directly in front a Ford



The Cow Motorist Always Thinks He Has a Complete Monopoly of the Road.

car occupying his two-thirds of the road. I managed to get past him simply because fortune was with me and there was no car approaching from the opposite direction. If, however, a car had been approaching I'm afraid that the Ford car would have been somewhat damaged since the car I was driving had 4,000 pounds of dead weight behind it.

If I had rammed the Ford car the law probably would have been on his side because he was entirely within his legal rights, but morally he was obstructing the road, and the blame of the accident would have been upon his shoulders, for he did not need to make the stop at such a dangerous place.

There is another reprehensible practice in parking which I'm sure that every reader has noted: that of parking or stopping on a narrow road directly opposite from another machine. Such a procedure narrows the road down to a danger point whether it be indulged in upon a curve or upon a "straight-away." There can be no justification for this practice and the careful driver will never countenance it.

In the matter of driving, many motorists possess the attribute of the cow in their desire to occupy a strip of road which by all rights belongs to someone else. This is well illustrated by the driver who cuts in ahead of you and then holds out his hand showing his intention to make the next corner or stop entirely. The mere cutting in ahead of another machine is often accompanied with great hazard.

Cutting In

To consider the two things in order, cutting in, and stopping a car ahead of another which is going at normal speed. There is a vast difference between passing a car and cutting in ahead of it, and many things to consider. The cow-driver has but one idea in his head, to get ahead of the car in front. His method is to "give her the gas" and pass, then to get back to his side of the road at once. In so doing he may swing his own machine close in front of the machine he is passing and unless the other driver retards speed an accident is bound to occur.

At this point I can almost hear many readers itch to voice an opinion. They may contend that the machine, which is cutting in, is forced to make such a maneuver as self protection against a car approaching from the opposite direction. But this is seldom a logical excuse.

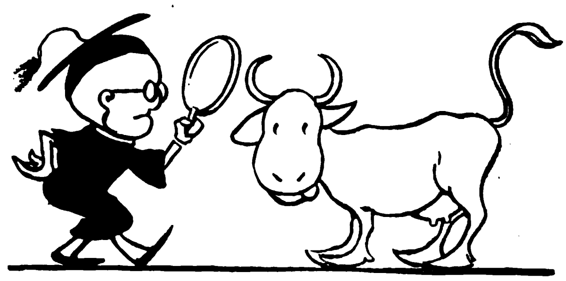
Before passing another machine, the driver should be able to see far enough ahead so that he is sure that he can get safely past before he is forced back to his side of the road. After he has passed the machine he should attain sufficient lead over the car he has passed so that the latter will not be forced to make a quick reduction in speed.

The fellow who cuts in ahead, then stops his machine to light a cigar and does the same thing all over again a few minutes later deserves two black eyes and a term in jail. But there is no law against this and we sane motorists must try to grin and bear it.

I doubt if anything is more annoying to the normal motorist than the driver who refuses to let anyone past him and who also tends to lag back. This sort of fellow will drive along about 20 miles an hour for a few minutes, then without warning check his speed to 10 or 12 miles an hour. If one tries to pass him he immediately accelerates and swings over to the middle of the road. He will run his car 40 miles an hour if needs be to prevent anyone from passing and then, as soon as he is sure that the fellow in back dares not pass, he checks his pace to a canter. To call this fellow a cow-driver is an insult to a lady, who at least is not intentionally rude.

Mrs. Cow is a rather patient beast and I hate to injure her feelings by making another comparison, but since road etiquette enters into discussion, there is a point which should be taken up here. I refer to the matter of obstructed roads where passage can be had in one direction only.

In general it is pre-supposed that if the North or West side of the street is closed, the traffic in the East



If We Asked a Character Analysis of a Cow What Would We Get?

or North directions, respectively, has the right of way. Conversely, if the South or East side of the street is closed, the traffic in the West or South directions, respectively, has the right of way. In other words the driver who can keep to his right and pass the obstruction has the right of way in all cases. This may be the law, but is it etiquette?

Suppose that there is heavy traffic in one direction

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and this traffic can keep to the right and has the legal right of way as outlined in our previous paragraph. The obstruction may retard traffic so that there is practically a continuous stream in the "right of way" direction. This being so it might mean that the cars from the opposite direction would wait for hours for an opportunity to pass.

The honorable driver will think of the old adage of "first come, first served" and if he arrives at the obstruction to find that someone is waiting on the other side, he will allow them to pass.

This point brings to my mind the occasion when I

Squelch the Fool Driver Who Cuts In Ahead and Then Stops to Light His Cigar.

was driving over an "under construction" road. Unfortunately I arrived at the construction point just as a tip-cart deposited a load of crushed rock in the middle of the road. One cannot drive a two-ton car over a three foot pile of broken stone very easily, and I adopted the alternative of watchful waiting while the workmen leveled the rock into a passable mass. The delay was some three or four minutes and during that time some ignorant driver behind kept his finger on his horn button steadily. I was in just as much of a hurry as he, but could see no reason for such blatant uneasiness.

Passing Another Vehicle

The matter of passing another vehicle is one which deserves comment. I have mentioned the subject of overtaking and passing or cutting-in, but spoke more especially concerning the cutting-in phase. It may be true that every motorist has a right to the road and as yet there has been no special law passed regarding the proportion of road occupied by vehicles. Legally a driver may insist upon occupying a section of road up to the center line and if two such drivers meet then there is apt to be confliction.

The situation is much the same as that of the meeting of two Orientals. Each one waits for the action of the other and the one who can wait longest is considered the better caste. When two drivers of the "cow" class approach each other, each keeps as near to the center of the road as possible and the one who has the strongest nerves eventually drives the other fellow to the sides. We are all familiar with the genus "road hog."

On my last trip a Ford car passed me going some 40 miles an hour; he cut in so closely that I had to swallow twice to keep my heart in its place. Despite the fact that the road was nearly wide enough for three cars to pass, the driver of the Ford car cleared my machine by the fraction of an inch. It was only by luck that my brakes worked effectually in checking the speed of my car or I would have hit him a glancing blow which would probably have ditched both our cars. This was merely an incident to illustrate the character of the driver. I mentioned openly to my friends that I knew exactly where that driver was bound for at some future date.

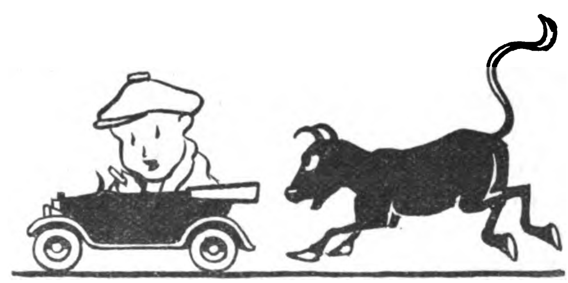
One can hardly hope for immediate fulfillment of one's prophesies but in this case mine were, for within ten minutes after the Ford had passed us we came upon him again. His front wheel was firmly locked with the front wheel of a heavy lumber wagon. The lumber wagon was at the extreme right of the road, in fact one side was running in the ditch, yet that Ford driver was not content and had cut too close to it. I doubt if the collision harmed the wagon, but hope that it caused the driver some annoyance. The mere fact that we passed the two vehicles with a large margin of clearance is proof that the accident rested wholly on the Ford driver's shoulders.

The Spirit of Road Ownership

This spirit of road ownership is typical of many drivers who seem to delight in trying to cut as close to other vehicles as possible. Give them half the road and they want three-quarters; edge over into the gutter and they will follow until they occupy all of the road. Only by concerted action can sane and decent drivers hope to eliminate these pests.

My article cannot be complete if I mention only the cow-drivers. The driver is not always to blame for accidents, cows of the bovine species are not the only ones loose on the highways, for many of them walk on two legs, singly and in pairs; I speak of certain pedestrians.

Now I want no misunderstanding regarding my attitude toward pedestrians. I believe that persons on foot have equal rights, under certain conditions, with automobilists, but there is no more reason why they should "hog" the road than for the autoist. I believe, also,



If You See a Cow in the Road, Stop and Look for a Detour, It's Safer.

that if there is a sidewalk, parallel with the road, the pedestrian has no more right to use the road to stroll along than the autoist has a right to use the sidewalk.

When I read of automobile accidents in the newspapers I always wonder what the true details are, especially if an autoist has injured or killed a pedestrian. I often wonder why there are not more accidents be-

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cause though there are many laws for the driver to obey there are none directed toward the pedestrian.

When Mrs. Cow walks alongside or in the road she is merely using that method of getting to her destination. She does not willingly obstruct the road, but cares only to be left in peace. On the other hand, the pedestrian who walks in the road should have brains enough, theoretically, to preserve his own life and keep as near to the side as possible.

The Rights of Pedestrians

In going through country towns, how often we see people using the roads for their strolls. We often find groups of people in the streets regardless of the fact that wide sidewalks are provided. We can imagine the howl of displeasure that would arise were we motorists to drive along the sidewalks.

It is a comparatively easy matter for the pedestrian to step to one side of the road should it happen that two automobiles are passing at that spot, but if the pedestrian insists upon occupying more than his share he is not only in danger himself but is liable to cause injury to others and damage to property.

And this brings us back to the personal element which affects automobile driving, outside of the drivers themselves. The cow herself is now under consideration. You cannot blame Mrs. Cow for being in the road, she would probably choose a field of green clover rather than a flat, rolled mess of tar; it is her owner who is to blame.

The autoist needs education, admittedly, but the man who does not own or drive a machine needs it more. The autoist does not run over live stock intentionally, as a rule, because he does not like to "mess up" his car. If the owners of chickens and animals were reasonably careful in allowing their live stock upon automobile roads, there would be fewer accidents.

Who Is Mostly to Blame

Before I compiled this article I conferred with the adjuster of liability insurance from one of our National insurance firms. I asked this gentleman this question: "In your experience of adjusting damage done by automobiles to persons and to live stock without considerable damage or injury to other automobiles or passengers in other automobiles, what is your opinion as to the placing of blame?" His answer was simple and should be very satisfactory to all of us who drive cars. He said: "Out of all the accidents which I have adjusted in the past few years, I would say that less than ten per cent are blamable to the drivers of the cars."

This adjuster went on to say he was morally sure that over 90 per cent of the accidents, which he had investigated, could have been avoided had the pedestrian exercised due care in walking upon or crossing the streets and had the owner of live stock taken sufficient care of his property.

Having completed this much of my article I submitted it to the adjuster spoken of in the last paragraph for his comment. I am glad to report that he agrees with practically all I have said.

"If all motorists will observe the rules of automobile etiquette which you have promulgated in this article," he said, "I do not doubt but what the number of automobile accidents could be greatly reduced."

So remember, in driving or in walking, that though the law may be entirely upon your side, a decision in your favor will not restore a broken limb or the life of those in your charge. Use discretion and don't be a "cow driver." When you feel that you should assert your legal rights remember the story of the fellow who—but here is the story.

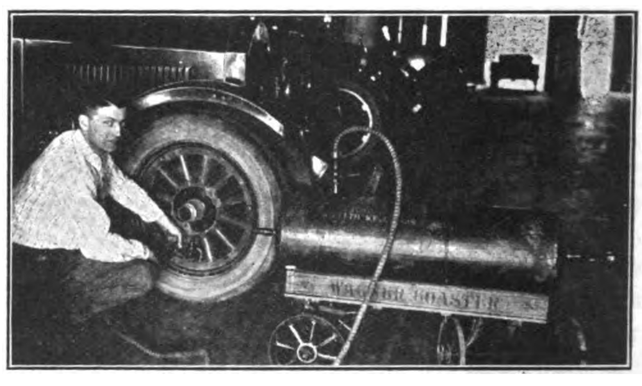
A man was driving a Ford car in a certain city when he came to an intersecting street. Coming from his left at high speed was an enormous truck and using his common sense he slammed down the brakes on his little flivver. The passenger in the Ford car raised his voice in protest: "Why in the dickens didn't you keep on?" he asked, "you had the right of way, didn't you?" "Yes," softly answered the Ford driver, "but the other fellow had the right of weight."

HOMEMADE PORTABLE PRESSURE TANK

By Dale R. Van Horn

THE portable air pressure tank shown in the photo helps out in a busy garage, and the expense incurred in procuring the tank was very small. A coaster wagon of the standard type was used for the truck.

Both the front and rear ends of the box were cut out to conform to the curve of the tank. This was then held in place by a small rod, threaded at both ends and run through holes in the wagon box. A strip of strap iron



placed across the under side of the box with the nuts in place, holds the tank rigid.

Not much of a reduction in expense, to be sure, but the garage proprietor who cuts down the overhead in these days is sure to realize more on the right side of the ledger at the end of the year. And, too, the auto owners like to patronize a man who is ingenious and continually calling into use, new ideas.

It pays.

LIQUID MEASURE

Nipp—How far is it to the next town?
Chauffeur—About three flasks.—*Life.*

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An Answer for Mr. Swinney

A Reader Has Asked About Soldering
Here Is a Complete Reply for Him

By Donald A. Hampson

CASE No. 3021 has trouble with soldering brass and steel together. I will offer a suggestion for the man from Missouri, if you don't mind. I was brought up in a school that taught that "you can solder anything but aluminum" and I modestly admit that if there is one thing that I can do, outside of the machinist's art, it is to solder. Professional solderers fuss along with acid and spend much time cutting it with zinc. That's all right in a tinner's well regulated shop but it isn't all right when you can't get fresh acid and there is no zinc to cut it with and the garage mechanics would be certain to get hold of the acid bottle when your back was turned and drop the blamed thing on the cement floor. Then when you don't have an electric soldering iron or a gas flame or a charcoal burner or a blow torch, you can't heat your iron as you have been taught.

So I have come to regard these things as luxuries and all I ask is a blacksmith's coal fire and a little soldering paste; you can get these anywhere and there is nothing to prepare and nothing to spill. Professionals turn up their noses at the paste—"that electricians' stuff," they say—but I can tell the A. D. & R. readers that paste has done as well for me as acid ever did. Soldering paste comes in little tin cans about the size of those holding valve grinding compound; it has every advantage—the cans do not break, the contents cannot be spilled, and the paste is as strong five years hence as it is now. What more could one ask? If you *have* the luxuries of soldering, well and good, but don't cry for them.

In soldering two pieces together, you *must* have the following conditions satisfied—

The work must be clean and the iron must be clean.
The iron must be hot enough but not raised to a red heat.
The iron must be tinned before applying to the work.
Both pieces must be tinned before attempting to stick them together.

The man from Missouri has not satisfied all of these "musts"—and the same is true of others who are unsuccessful in soldering. Some do not know the fundamentals of the work, others disregard them either through carelessness or through trying to fool themselves into thinking that all are not essential—many a good man does this latter when he is rushed.

Cleanliness

Dirt, mud, paint, grease, oil, etc., are the enemies of solder. Clean off all trace of them for at least an inch outside the area to be soldered. First, scrape them off, then file and sand paper the surfaces bright. If there are blowholes in the piece or drilled holes, either clean them out bright or scrape them bright for an eighth of an inch away from the surface. If you wish to solder clear to the edge of the surface, clean that edge also. Unless there has been grease or oil on the surface, the above preparation is sufficient. There is then no chance for dirt to work on the surface being soldered, from the surface itself.

Greasy surfaces should be wiped dry and then boiled in some such solution as hot soda water. For small parts this is the very best way and extremely simple; the pieces come out dry and free from grease—all that is necessary is to brighten with emery cloth or sandpaper. If the pieces are too large to boil, they will have to be filed or rubbed with abrasives until a clean surface is exposed but the filing will have to be carried quite deep to take out all the oiliness that works into the pores of the metal. One way to dispose of the oil is to burn the surface with a blow torch; another is to wash with gasoline or kerosene; but modern "gas" leaves a residue which gets under the surface and requires some coaxing by the flux before the solder will adhere—and the same is true of the oil burned off.

Surface Must Be Clean

Remember, that the surface to be soldered cannot be too clean. It may seem clean but not be chemically so. And clean area enough so a slip of the iron will not run into foreign matter that will be carried back on the work and retard it.

With the possible exception of electric coils inside, practically all means of heating soldering irons will make them too hot if they are not removed at the proper moment from the fire. Overheating melts off the tin that has previously covered the iron and it scales the surface so that it cannot be again tinned until the scale has been removed. The point of the iron must then be filled up clean and bright and re-tinned. A man who watches his heat carefully seldom has to go to this extent. Then there is the dirt of the fire that sticks to the iron as it is withdrawn and will be carried on the work unless it is removed—this is particularly true of coal fire work. It is a good plan to pass a file lightly over each of the four faces as the iron is taken out of the fire. (Tinners have a trick of wiping the hot iron off with their apron or on their overalls but this is not recommended for the automobile fraternity.)

Solder runs like water at 650 degrees. It is necessary to raise the temperature of the iron above this in order to provide a reserve of heat to carry on the work for a few minutes before reheating the iron but the bulky copper end is planned for the purpose of holding much heat and passing it down to the point where needed.

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At a heat of 1350 degrees, scale forms on the iron and adheres to it—at about 2000 degrees the copper melts; to thus heat an iron two and three times as hot as is necessary is pure carelessness but it is done every day in shops, more especially where several employees use the same iron. An overheated iron loses its "tin," which is to the soldering iron what oil is to a bearing.

On the other hand, an underheated iron will not heat solder sufficiently to cause it to flow. The various functions of the iron are—to heat the work and the solder, to spread the solder on the work, to carry solder from the stick to the work. As the iron cools in use, those portions of the work should be performed which demand a cooler iron. Heeat, it will be seen, is relative. A cool iron will carry solder from the stick where a hotter one will not because it liquefies the solder too much for it to adhere in globule form. Where a depression has to be bridged or a section built up, the iron is used at a lower heat.

Experience counts more in the matter of heat than in any other detail of soldering. Incidentally, it teaches one to employ a higher heat for aluminum, steel, and cast iron than for the same process on copper or brass.

Tinning

Many workmen fail to grasp the necessity for coating the soldering iron with solder before applying the iron to any class of work. This is called "tinning" though the term is not strictly correct because solder is only one-half tin; however, it answers very nicely for a name.

To tin the hot iron, pass a file across the faces lightly to remove any scale or surface dirt. Then apply the iron to the stick of solder on all four faces, rubbing it around for better contact and shifting to the cake of salammoniac occasionally, the latter being a flux and cleaner. Two minutes should tin any iron that is of the right heat. The tinned point will shine like new tinware—and one of the marks of skill is the ability to keep this kind of a point for a long time without burning it off.

An untinned iron will not carry solder from stick to work, it will not spread solder that is already on with any degree of success, and it will dirty the work so badly that the latter will have to be scraped before proceeding. One of the chief reasons for using a copper soldering "iron" is the readiness with which copper may be tinned; and if the iron is not tinned, one might as well be soldering with a piece of metal. The man who never starts to solder until his iron is thoroughly tinned will have little trouble with his work.

After cleaning the work pieces, put the iron in to heat and during this wait, spread a little paste on the surface to be coated—acid, if you prefer. Then, with a tinned iron, rub the surface of the work until a thin even coating is applied all over. If the area of the surface to be soldered is small, enough solder will be transferred from the iron itself to tin the work; if the area is large, it will be necessary to feed a certain amount of solder to the iron which may be done by applying the iron to the bar of solder and carrying as much as will stick or by holding the solder in the left hand with the end of the bar in contact with the iron as it is passsed over the surface.

Tinning the work is preparatory. After that has been done, the work of filling up holes or sweating two pieces together or building up the surface to a new height or a bridging job may be carried on at will.

Solder will not adhere to a cold surface. It is one of the functions of the iron to heat the work and to keep it warm enough so that solder will stick. It is quite possible and often advisable, to heat the work by other means, using the iron simply as a tool to bring and spread the solder. This is true of tinning. It saves a great deal of time if a piece of work does not have to be heated by the inefficient means of holding the point of a soldering iron on it. Work that is laid on a hot plate or placed over a gas jet or so heated on top of a fire that its surface is kept clean may be tinned in a jiffy—at the touch of the iron, the solder seems to flow like water. forming the best kind of a tinned face upon which to build, i. e., one with a thin, even, well set coating.

Proceeding with the Work

Solder comes regularly in bars, or sticks, about a foot long. Then it is made up into wire also, a form that is extremely handy for automotive purposes. The full sized bar is rather bulky to feed to the iron on a delicate job but it can be made fairly convenient by hammering one end to a crude point.

Acid, paste, and salammoniac are the condiments of soldering. The writer prefers paste and salammoniac—the former to apply to the work to make the solder stick better and the latter for cleaning the iron. The Chicago Solder Co. supplies a wire solder with a flux that is pocketed in the wire and is released as the solder is melted off upon the work; this works very nicely on the ordinary metals but the salammoniac (obtainable everywhere at a nominal price) is a desirable adjunct for the iron even when self-fluxing solders are used.

Both Pieces Must Be Tinned

In joining two pieces, both must be tinned. After that, the nature of the two makes no difference for the bond between them is built on the tin. Both pieces may be of the same metal or they may be different.

If any lumps are left from tinning, these should be filed off with a clean dry file. Paste is then applied and the two pieces clamped together. To form a union of the two, it is necessary to raise their temperature to the melting point of solder thus causing the solder which exists in the form of a "tin" on each piece to melt sufficiently to become one with the tin on the other piece. There is no question about the two pieces joining, after they have been once tinned, if they are heated to the point where solder will flow.

This heat is attained in various ways. It may be that the heat of the iron is enough; on thin sheet metal where the iron can be applied to the back and to the edges, this is all that is necessary and in any case, the iron is used around the edges to fill up and to carry heat in from that location. Thicker parts are heated enough to make the solder "sweat" in other ways. A blow-torch may be used where there is nothing inflammable about the job. The flame from a Bunsen burner is a clean hot flame.

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Chunks of cast iron or steel may be heated to a red and the parts being joined be laid on them in such a position that the heat runs to the tinned section. Still another way that is applicable to light pieces is to get both tinned at the same and to clap them together while the solder is yet soft.

Soldering two pieces together as described is called "sweating." When well done, it offers a bond that is about as strong as brazing. In steam engine work, split bronze bearing weighing hundreds of pounds are sweated together and holds so tightly that the bearings can be machined all over without coming apart.

Besides joining two pieces together, soldering finds a number of uses such as strengthening a cracked piece, filling holes, as a fastening where screws cannot be applied, building up a worn surface, bridging a gap such as a hole worn in a gasoline feed pipe, etc. The principles are the same as for any soldering. It makes no difference what the metals are so long as aluminum does not enter.

Mr. Swinney's trouble has been either that he did not thoroughly clean the parts or he did not tin his iron or his heat wasn't right.

Author's Note: This was started last week as a brief helper for your correspondent but soldering is such a joy to me and I've been going to write something about it for a long while that I unconscientiously wrote on and then I got so busy I couldn't finish till now.

Illustrated Ideas

Repair Kinks of General Interest to Those Who Tinker on Cars

By Joe Bell

WITH the advent of left-hand drive and center control, came the cane handle lever with a lower portion like that in Fig. 1. Also, there came with this another part to break, for many of the levers have a pin hole H by means of which the cap and spring are held in place. Usually this hole is larger than need be and takes away the best part of the cross section, weakening it so that the constant pushing coupled with other stresses results in a break at this point.

Where new levers are sent out undrilled, this trouble may be avoided by putting in a pin not more than half the original size; if this reduction is carried too far, there is merely a pin to replace, which is days ahead of an entire lever.

To make up a whole new lever in a local shop is quite a job, and expensive, involving the turning down of a 1¼" round piece about 26" long in order to get the pivotal ball. A better way is to drill a hole through this ball ⅝" in diameter following the original axis.

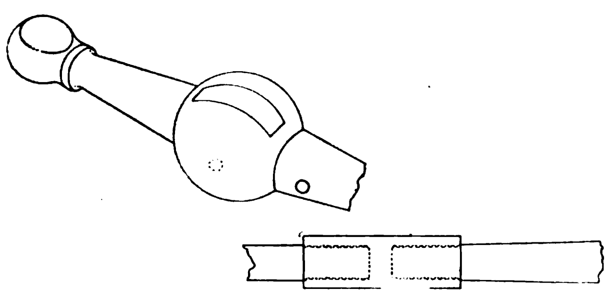

Figure 1 at Left; 2 at Right.

Then turn a new lever, or handle, from a piece of ⅝" stock, making this a driving fit through the ball and inserting a small pin P as shown dotted. The labor involved thus is very small; the lathe tailstock is set over and one or two light cuts finish the long end as delicately tapered as the stock lever and as easily as a straight cut would be made. Depending on the size required, the lower ball end is flattened by filing, or else by forging when a larger end ball is demanded to fit the shift notch.

When the lever breaks on the handle end, the simplest repair is shown at Fig. 2. Often this can be made without removing the body of the lever by cutting one thread with it in the car. The other end is threaded in a vise and then the two parts are joined by a thimble. Screwed tightly up, this makes a neat, cheap, and durable repair. If the rod at the break is about ⅜" in diameter, use the 24 thread die for both ends and make a sleeve, or thimble, 1½" long out of ½" stock, rounding corners for a neat finish.

VERY simple tools will answer for very close work when there is a good head to direct. An out-of-

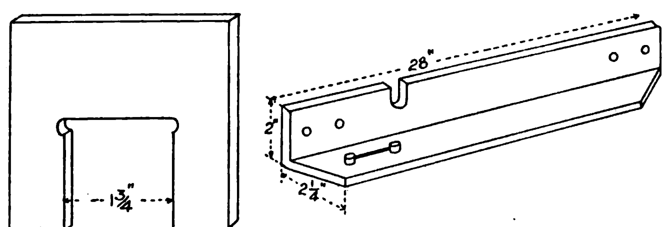

Figure 3 at Left; 4 at Right.

the-way garage got a lot of work on one make of car. This work involved two or three crank shafts a week and the mechanic did his best without micrometers. He used gages (called "snap gages" in manufacturing shops) such as shown in Fig. 3. There were six of these, ranging in size from the nominal diameter down to 1/100 of an inch less. They were well made, too; the mechanic certainly had skill—said he made them in the winter, cutting them from pieces of chassis frame and using paper as a means of getting the steps in size.

Though it takes a skilled man to make such gages, any careful person can detect the merest difference in size by their use. In manufacturing, such gages are made double-ended with the opening in one end 1/1000 inch smaller than the other and this form of gage is so positive that the unskilled readily detect such difference

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or less. By means of his gages our garage man could tell if one journal was larger than another, if a journal was out of round and where, and he thus had tools more accurate than calipers if he had to file or turn the journals. Applications of this plan will suggest themselves in many a private and public garage.

FIGURE 4 shows a part that be familiar to workers on the Mitchell car. Only this one is not a factory part, nor is it of pressed steel. A tourist far from the Mitchell factory or any of its branches broke this engine support. But the local garage man knew something of structurals and he made a new piece from 2½ x 2 x ¼ angle. Cutting down one leg a little, notching and drilling, and inserting the posts took but little longer than assembling it on the car, which in this case involves some crowded working. However, the repair was installed in good time and was of equal strength with the original.

SOME people buy an old car for the fun of rebuilding it—others do the same thing with profit in mind. The latter may easily prove to be "loss" when the mechanism is dismantled. Occasionally a car that has been through a fire has previously been through something worse, as had the car which brings Fig. 5 to our attention—part of an old Norman.

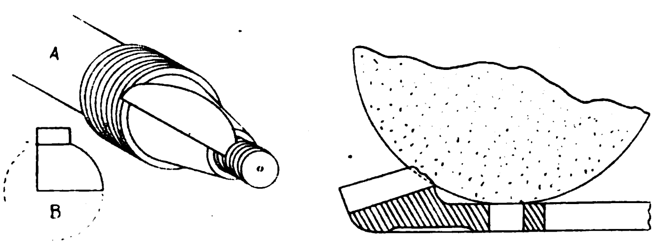

Figure 5 at Left; 6 at Right.

This is the pinion end of the drive shaft and after the new owner of the old car had ascertained that it would take six weeks to get the obsolete part and cost him a good week's pay, he started out on a local shopping tour for advice. The other end of the shaft was much like that shown at A but was straight instead of tapered. The old shaft had been bent, the threaded end had been broken off at the forward end, and the pinion key had broken out a generous chunk of the taper end.

At a cost if less than $5, this shaft was made serviceable. Straightening was a simple matter. The cracked-off thread end was repaired by drilling in the shaft and tapping it out for a ½" S. A. E. cap screw; this answered as well as the original for keeping the universal yoke to its position.

There are countless instances of tapered and shafts breaking out ahead of Woodruff keys and the best repair that we know of is shown by A and B, Fig. 5. A milling cutter of suitable diameter is selected and the broken shaft milled out, clear to the side, with one face of the cutter touching the good side of the original keyway. A key is made for this as shown by the end view at B; this is like a stock Woodruff key except that it has an extended portion at the right side which fills the space where the break was and which is shaped on top to conform to the taper end over which the pinion fits. Next to a new shaft, this is the strongest kind of a "fix" for such a break.

A TOOTH had chipped off and the piece of hard steel had become lodged between two pinion teeth with the result that all the master gear teeth had been chewed off at their inner end as shown at Fig. 6. Now, this offending slug of hard steel would not have chipped more than six teeth if the number of teeth in the ring had been a multiple of those in the pinion—but designers are loath to use such a gear ratio and so it does not take a mile of traveling for a particular tooth in the pinion to contact with every one in the gear.

New York was out of these master gears and the owner wanted to use his car. He was perfectly willing to risk the old gear if further chipping could be prevented—and a machine shop endeavored to fix him up as illustrated by Fig. 6. They put a small wheel on the grinder and were thus able to get inside, as shown, to smooth off the jagged portions of the teeth. This done, there was left an otherwise perfectly good master gear to put back in the car.

There are countless instances where a gear could be saved by beveling off the corners, removing the ragged edges and grinding below any crarcks that may have been started by a broken-off chunk as it whirled around between the pinion teeth on its cycle of destruction. It is rather seldom that a master gear is broken in the middle or clear across—usually it is at the corners that breaks occur.

Grinding off gear teeth has but one disadvantage and that is that it lessens the wearing and resisting length of the tooth but usually the reduction is not so great as to be serious and the gear can safely be put back in the housing. The car owner who gets a gear ground off as described expresses surprise when the shop charges him for wear on the emery wheel as well as for the workman's time; however, this is a just charge for, even in the hands of a careful man, the hard sharp tooth edges dig unmercifully into the emery wheel and may easily cut away fifty cents worth of effective material—more in a few minutes than from a whole day's grinding on ordinary work.

THERE is a milkman in our town who is more ingenious than the average. He had a Ford delivery car for his hack work but his feet were too broad for the Ford pedal layout and he traded for an old 490 Chevrolet. He shortened the body of this car and put on a set of demountable rim wheels which were two inches smaller than the original.

Though entirely ignorant of theory, these two changes which he made were based on good sound engineering for the results he wished to obtain, i. e., to give him greater carrying capacity with as little added stress as possible to the working parts. The smaller wheels gave him greater effective power from the same engine; the shortened body threw more of the load on the front axle than formerly and allowed the rear axle to take the over-

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load he proposed with lessened chance of damage to itself.

The regular load it was desired to haul was 1200 lbs. besides the driver and tanks full. This is too much for the "Chevie" springs and our friend hit upon the scheme shown by Fig. 7, which might well be copied in other rebuilding jobs at home. It is a simple, very efficient graduated spring system. The stock springs are of cantilever type. To these were added a full elliptic spring on each side, these springs being fastened to the body and no where else. If the body is sufficiently depressed, the short lower leaves ride on the upper face of the existing spring clips of the cantilevers. With a light load, the elliptic springs do not touch the rear axle assembly but with any excess they take up the burden and relieve the others—this same system is found in the most modern piece of street railway rolling stock, the "safety" car. In this case, the auxiliary springs

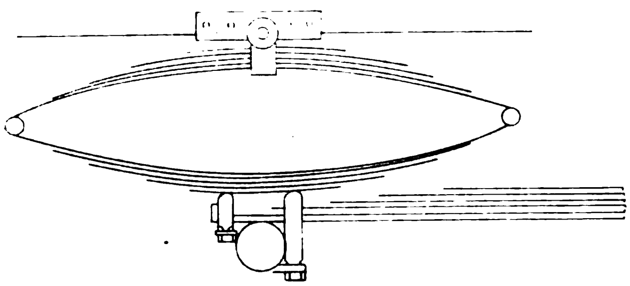


Figure 7.

were culled from a defunct grocer's wagon and they work so well that Mr. Hull frequently exceeds the speed limit with 1700 lbs. at his back.

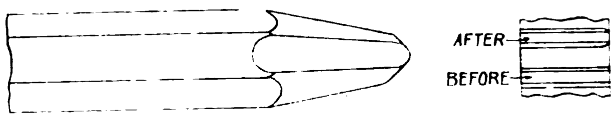
THE tooth rounding machine is a distinct product of automobile manufacturing needs, born of the sliding gear. And tooth rounding is almost as rare a job in the repair shop as gear cutting.

We had a tooth rounding job the other day—169 teeth to be rounded on a starter ring. A fellow with a lathe of his own had to replace the starter ring on his car and when the ring came it was ¼" too wide, which excess he thoughtlessly turned off the rounded side. Then he brought it in to us to put in condition. "Why, haven't you got a round cornering machine?" he asked in astonishment. He was informed that the nearest machine was probably a thousand miles away, also that *he* could round them up by hand as quickly as we could, but the latter did not meet with approval.

Fig. 8 is the form of tool we used—a gouge chisel made up to suit the round needed on the tooth ends. One cut down the tooth left it with a very passable round that did not require filing—(see the "after" view of a tooth in the small drawing). It took half a day to finish up the starter-ring but the result was quite satisfactory.

DRILLING is the most frequent operation in repair work, next to some strictly hand processses. Figs. 9 and 10 show two drilling ideas of more than passsing value.

The first is a means of extending the reach of a drill press or, more frequently, a breast drill or portable drill. There are some hand breast drills on the market with the chuck and shank readily detachable and this unit may



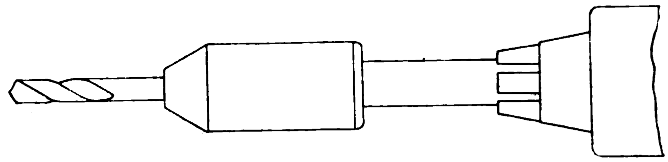


Figure 8 at Top; 9 Below.

then be caught in the chuck of another drill as has been done in Fig. 9. When a hole has to be drilled far up between surrounding parts some form of extension, as this, must be used. There is one maker who puts out a slim chuck, similar to that shown, with the shank an integral part of the chuck, the whole selling for about $3 and being intended for just such drilling jobs in restricted locations.

DRILLING "up" is the hardest kind of hand drilling—it takes more strength to feed the drill than to turn it, which is doubly true when the electric drill is used. Fig. 10 shows the hardest kind of an up drilling job or it would have been if the mechanic hadn't used his wits and applied a "lever feed" to his machine, making it child's play to bore these ½" holes in the lower half of the frame. There happened to be this piece of board lying around and it became the necessary lever to put under the drill—and very often it is more convenient to do this same thing when drilling downwards or horizontally than to depend on brute strength alone.

In connection with portable drilling, a word of advice

Figure 10. Drilling Upward.

is in order. When buying an electric drill, get one whose speed is slower than the average. A speed of 500 r. p. m. is plenty fast enough for any hand drill used on repair work—the faster speed of a stock drill will not save two hours in a year's time and against that you will have drill wear of a dozen times that amount of

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money. If the drill is bought direct from a manufacturer, it will cost only three or four dollars extra to have it done through with a winding for slow speeds; if it is bought at a store, buy a size or two larger to secure the slower speed—it doesn't cost any more to drill the same size hole with a large electric drill than with a small one.

Shooting Trouble on the Ford

A Complete Discussion of the Ordinary Troubles Which Often Vex the Ford Owner

By John G. Whyte

EVER have your Ford develop a sudden and constant backfiring while running in the high speed? It ran very well idling and perhaps fairly satisfactorily on low speed but the instant you dropped into "high" that popping began again.

If you will remove the cover from the coil box on the dash, allow the motor to run and place your fingers on the vibrator spring of each coil separately, you will find that three of the coils are buzzing intermittently as they should while one of the four is buzzing steadily. The vibrators are only supposed to vibrate at the time when the given cylinder is to fire, so if one of the four is vibrating constantly it is reasonable to suppose that the spark is occurring in one of the cylinders constantly with the result that the incoming gas is being exploded while the intake valve of that cylinder is open, causing the backfiring.

You will find the trouble in or around the *commutator*. It may be that one of the four commutator wires has worn or that there is open insulation allowing the bare wire to touch metal, thereby causing a "ground." Or it may be that the constant rotating of the commutator roller within the shell has cut off a sliver of metal which is touching some uninsulated part of the commutator and is grounding. These things would cause the constant vibrating of the coil.

The remedy in the case of the wires would be either to tape the offending wire or replace the wire assembly complete. To replace the wires is the safest as these wires soak up with oil vapor from the breather pipe very quickly. If putting new wires in position it is well to tie them together with a good grade of electric tape. This will materially assist in making them oil proof.

If placing new wires on the commutator, be careful to get them on correctly as one misplaced wire will cause incorrect firing of the motor and may cause back-kicking. Looking to the front of the motor, as the shell sets on the timing gear case, the first contact point to the RIGHT is number one (No. 1). The direction of rotation of the commutator roller is to the left, opposite the direction in which you turn the crank and as the firing order of the Ford is 1-2-4-3, the next contact terminal is number two, the next is number four and the last one number three.

The commutator wires come in standard colors. Black, red, blue and green. Black is number 1, Red is number 2, Blue is number 3 and Red is number 4. The fifth wire which comes is the cable for lighting and will be treated with later.

Therefore in placing the wires on the commutator shell, you will place the Black wire on number 1, the Red wire on number 2 and according to the firing order, the Green wire on the next terminal in rotation which will be number 4 and finally, the last Blue wire on number 3. Arrange number 3 and number 1 OVER the top of the shell and number 2 and number 4 UNDER the shell. In this manner they will fold safely away from the fan, preventing their being cut or grounded.

In placing the other end of the wires on the coil box, you will find that they are cut the exact length to go into position readily. As you sit in the seat, the first coil box terminal to your right is number 1. The Black wire will go on that terminal. The next in rotation will be Red, number 2, the next Blue, number 3 and last, Green, number 4. Notice that while the wires are arranged 1-2-4-3 on the Commutator they are arranged 1-2-3-4 on the Coil box terminals. This is to facilitate finding which cylinder is "missing" as will be seen later.

If a new Commutator shell is put on it is well to also replace the commutator roller, as it is usually a loose or worn roller that tears up the shell. On the forward end of the shaft which drives the commutator roller (the Cam-shaft) is a large nut. Turn this off to the left. Then there will be a thin shell which holds in place a small pin which passes through the roller, causing it to turn with the shaft. Remove this shell and pin. The pin has a head and can be readily pulled with the finger-nails. If an early model Ford, *note the exact position of the roller* so as to get the new one back in the same position.

Getting the new roller in the wrong position would result in the motor being one-half turn out of time and it would not run. The hole for the pin on the earlier model Fords is drilled completely through the shaft. If a later Model, the hole for the pin is drilled half way through the shaft and therefore it is impossible to get the wrong position of the roller. Slide the new roller in position, insert the pin and shell and lastly the retaining nut. Do not take up too tight on the nut as sometimes this causes tension on the spring arm of the commutator causing it to stick, thereby weakening the contact.

When the new shell is placed into position, be sure that it slips properly into position in the groove cut for it on the timing gear case. Also lubricate it well with a light

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oil and insert additional oil at least three times per week.

On the other hand, if the wires, shell and roller on the motor are new, and there is no constant vibration of any coil and the back-firing continues, there is only one other place where you can look for trouble. Take off the valve doors on the motor and look for a valve that has stuck open. Gummed oil, or a valve spring pin coming out has caused the valve to remain open allowing the explosion of gas to pass into the manifold.

The Cure for Gummed Valves

The remedy in the case of gummed valves is to squirt kerosene oil on and around the valve, tapping it lightly to make it release and a final washing out of the valve springs and tappets with kerosene. After this operation shoot light oil around the valves. When this kind of trouble occurs it is well to wash out the entire motor with kerosene oil. Drain the oil out of the motor by removing the drain plug located under the transmission at the bottom of the crank case. After the oil has completely drained, replace the plug and pour into the breather pipe, located at the front of the motor, about two quarts of kerosene. Start the motor allowing it to run about thirty seconds after which drain the kerosene as noted before and fill up with four quarts of good oil. The oil should flow slowly out of the *top* test cock located on the right side of the crank case of the motor. If oil does not come out of the top cock, put in oil until it does. See that the cock is clear.

Accordingly it is seen that in the case of the motor back-firing or popping into the carburetor the causes are:

Ground in the commutator or wires.

Open valve or broken valve spring pin.

Motor Stops Suddenly

Ever go riding along with everything apparently serene and have the motor suddenly go dead without warning? To make sure it is not the fault of an empty gasoline tank make an investigation. If there is plenty of gasoline, the next step will be to see if there is gasoline in the carburetor. The gasoline may be turned on but may not reach the carburetor. During the active life of an automobile there is usually some gasoline in the tank and there are also several hours time during which the car is inactive, therefore allowing any sediment which may gather in the tank to settle to the bottom. If a pail of water is allowed to stand for any length of time you will always find sediment in the bottom of the pail. The same thing applies to the gasoline tank. Underneath the carburetor on the Ford car there is a drain plug which can be opened by turning to the left. Upon opening this plug, if gasoline flows out freely, you can hardly blame the trouble on the gasoline supply. If gasoline does not flow out you will know that the sediment has blocked the free passage of gasoline to the carburetor.

Underneath the gasoline tank will be found a "sediment bulb." At the base of this bulb is a drain cock. Open this and you will find that considerable dirt, water and other foreign matter will come out. It is well to leave the gasoline turned on while draining this cock as the fuel passing the strainer which is located inside the bulb will thoroughly wash any sediment from the face of the strainer which may be gathered there. After draining, you will find the gasoline supply correct again.

But if the trouble is not in the gasoline system you must look elsewhere and that will be in the ignition system. Take it step by step. Start at the source of supply of electric energy which is the magneto. On the top of the transmission cover, over the flywheel will be found an insulated plug with a wire attached. This is the magneto contact plug and is there to carry the electric current by wire to the coil box. Find out if current is coming through the plug. This may be done by having some one spin the motor while a "short" is made against the motor block with a pliers or wrench. If the plug is all right you will be able to see the flash of the generated current.

Insulated Contacts

If no current is found coming from the point, remove the point from the case by turning off the three screws which secure it. Upon examination you will find that either a piece of "tie wire" or the ravellings from the transmission bands have wound around the lower terminal of the point causing a direct "ground" thereby preventing the current from passing to the wire terminal on the top of the point.

If this is found all right and the trouble is not there have the motor cranked again and place your fingers on the vibrator springs. If there is no "buzz" of the vibrators, examine the commutator roller and see if the tension spring which holds the roller against the segments of the commutator is broken or has lost its tension. If this is found to be all right you must look yet further.

On the back of the coil box, and coming through holes drilled ino the dash, are several porcelain insulators with wire terminals attached. The upper four are the connectors for the wires which run to the commutator. The lower four are the terminals which take the spark plug wires. There are two others below these, one on either side of the coil box. As you sit in the seat, the one to the right is the *battery* terminal and the one to the left is the magneto terminal. As the majority of Ford cars start and run on the magneto, the battery terminal is seldom used. Disconnect the wire which runs from the magneto contact point to the magneto terminal on the coil box.

Attach this wire to the battery terminal on the other side of the coil box and throw the switch to the battery side. If the motor starts, the trouble was a broken wire inside the coil box, or a broken wire in the switch. This often happens and it is best to get a new coil box as the labor involved in taking apart the old box and making repairs would amount to almost as much as the cost of a new box. If the motor still fails to start, the trouble is a ground or open circuit in the "field coil" which is built into the motor and which, aided by the action of revolving magnets built into the flywheel of the motor, constitutes the source of electrical ignition energy on the Ford models. In the event of the field coil being grounded or open, it is possible to wire up four dry cell batteries, attaching one wire to the *battery* terminal and grounding the other wire

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somewhere under a bolt on the motor or transmission case. This will get you home but batteries are poor means of ignition on the Ford car as the vibrator coils consume considerable energy and the batteries only last a short time.

In the event of a defective field it is best to install a new field coil which will necessitate taking out the motor. It is possible to "burn off" a short in a field coil and at the same time recharge the magnets. If the field coil is in good condition the "recharge" will bring the magneto back into a condition about as good as new. However, field coils are constantly subject to hot oil and vibration and when they give trouble they are invariably of little use and the substitution of a new one is the wisest course to pursue. So, to sum up—If the motor goes dead, the causes will be:

Blocked gas line or sediment bulb, or
Grounded magneto contact point, or
Lack of tension on the commutator roller, or
Open wire in coil box or switch, or
Defective or open field coil.

Misfiring of Cylinders

As a Ford car has not an overly well balanced motor, the misfiring of one or more of the spark plugs will result in a very badly running motor, lack of the usual power and pep and what is commonly called "bucking" will be the result. A misfiring cylinder can be caused by one or more of many things,—an open or sticking valve will cause loss of compression resulting in a misfire. The remedy for a sticking valve has been gone over in this article. To test for a missing cylinder the old fashioned method of "shorting" the plug to the cylinder is hardly practical on a Ford motor. Using both hands, hold down the vibrators on the first, second and third coil units allowing the fourth to work. If the fourth cylinder continues to operate it is reasonable to suppose that the trouble is not there. Now hold down number four and number two and number one coils, allowing number three to operate, then hold numbers four, three and one allowing number two to operate and lastly hold numbers four three and two allowing number one to operate. When three of the vibrators are held allowing the motor to run on one cylinder, if that cylinder has a bad spark plug, the cylinder will fail to fire. In this method it is possible to find exactly which cylinder or cylinders are not firing and whether the trouble is in the plugs.

When spark plugs fail to fire, there can be several causes. Perhaps a cylinder is throwing oil, owing to a bad fitting or worn piston or rings. An ordinary plug will foul up with excessive oil, and fail to fire the charge of gas. There are special plugs on the market which are said to fire in a cylinder no matter how oily. It is reasonable, however, that excessive oil in a cylinder will tend to carbonize and the plug will foul in time, no matter what its construction may be. Clean the spark plugs carefully and wash them out with gasoline.

Broken Spark Plugs

Another cause of misfiring plugs is a crack in the porcelain insulator of the plug. When the porcelain is cracked it must be renewed. Some plugs can be taken apart and a new porcelain inserted. Others are built solid so that when the porcelain becomes cracked it is necessary to get a new plug. When in doubt about the porcelain being cracked it is good practice to take the plug out of the cylinder, attach the plug wire to the plug and lay the plug on the cylinder head. Turn the motor until the spark occurs at the plug. If the spark occurs at the points of the electrode, the plug is all right but if the spark occurs inside the plug, the porcelain is cracked.

Another cause of misfiring in a given cylinder is that a wire may be broken away from the commutator shell causing an open circuit. This may be detected by the fact that the vibrator for that cylinder will not operate at all while the rest are all right. In a case where number one and three cylinders fail to fire while number two and four operate, the cause will be in the commutator roller.

Investigation will show that the spring on the roller has broken or lost its tension, permitting the roller to drop away from the contacts at the top of the timer while it drops down and makes contact on the lower two terminals perfectly. Too rich a mixture in the carburetor will cause "galloping" and be another form of miss. This trouble is taken up later on.

Therefore misfiring cylinders can be traced to the following:

Sticking valve or broken valve spring pin,
Broken spark plugs,
Carbonized or oil soaked spark plugs,
Broken wire at the commutator.
Too rich a mixture in the carburetor.

Note:—If the trouble is "too rich a mixture" the trouble will not show up in the plugs when holding down the vibrator points.

(Continued Next Month)

YES, WHY?

Johnnie, aged five, was an enthusiast over automobiling. He had to sleep with his father one night, for the first time, and next morning he was greatly perturbed.

"Mamma," he demanded, "why does papa use the cut-out in his sleep?"

HIS DEFINITION

Mr. Bully was cross-examining a down-trodden witness.

"Now, sir," he thundered, "you have stated under oath that this man had the appearance of a gentleman! Please tell the jury how a gentleman looks—in your estimation!"

"Well—er—a gentleman looks like—er—a—er– " stammered the poor confused witness.

With unmerciful sarcasm the counsel plunged to the attack again.

"I don't want any of your 'ers,' and remember you are on oath! Can you see anybody in the court who looks like a gentleman?"

The witness's eyes for the first time showed anger, and he blared out:

"Stand out of the way and then perhaps I can. You're not transparent!"

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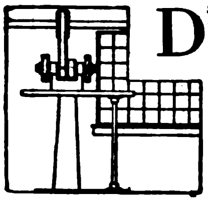
Courtesy and Business

You Cannot Get the Business Unless You Treat Your Customers Like Human Beings

Window Cards and Story by Franklin Myers



DID you ever hear of a store clerk who was making almost as much money per week as his boss? There's a man like that in Utica, N. Y.

One day I stepped into the store where he works and stated simply that I wanted to get a good Carburetor. He had just closed a sale and was giving the purchaser the final courtesies. The last words were spoken by the customer: "I thank you for your good service," said he.

This praise made me prick up my ears a bit. "How is it" I asked, "that most clerks fail in this matter of good service?" "Well" he said, "we can't all be great politicians, great soldiers, or great artists. Some of us must be clerks or farmers or cooks or other humble but necessary workers.

"I was like most clerks once upon a time, but something happened one day that woke me up. I was attending a big Rhode Island Clam Bake given by our Club a good many summers ago. We had the usual games before "the big feed" and when we all sat down to the table to eat, believe me, we were hungry!

Human Beings—Not Hogs

"Well the waiters—and there were about nine of 'em, began to rush the grub on the table and I must confess it was being done in a rather haphazard manner, when suddenly all the waiters were called aside by the Clam Bake manager, and he addressed them thus: 'I want you waiters to remember that you are not feeding a lot of hogs—but men—gentlemen if you please—men with souls—don't forget it!' That's all that manager said, but it was enough. The program was changed immediately and instead of hash-house treatment we received what might be termed elegant service. Why? Well, don't you see, the waiters wanted to show that they had souls too.

"I never forgot that lesson. I went back to the store with my secret hugged close to my chest and the very first customer that stepped over the doorsill that morning brought from me this remark in undertone, 'Here comes a soul!' I sold that customer almost without effort so to speak because it was no effort at all for me to wait on a soul, where before it did seem at times a little bothersome to wait on—well, we used to call 'em all kinds of names—cranks, muts—stiffs and so on.

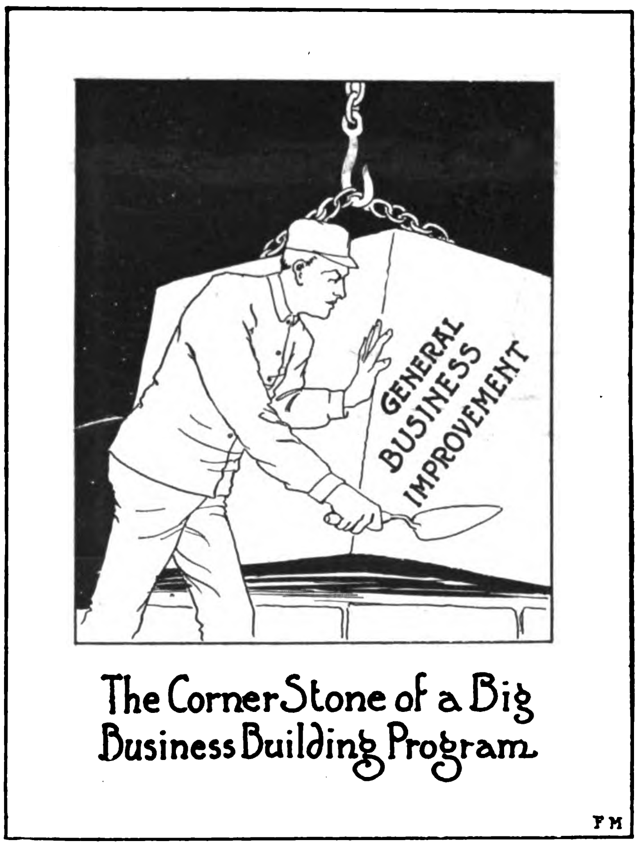
"I think that answers your question as to why most clerks fail in the matter of giving good service. A change for the better in the clerk's attitude to his customer is absolutely necessary first, last, and all the time.

"So firmly do I believe in the 'soul' attitude to my customers that if you should offer me the grandest time of my life tonight, and it was something that would interfere with my proper rest which might in turn interfere with my attitude toward my customers—I'd refuse, and I have refused many invitations to sit in a little game with the boys or to stay up all night at Mrs. Jones' party.

"In plain English, I am so very much *interested* in being a *first-class* clerk that I will not do anything which might have a tendency to set me down, or push me back into the second-class."

This very enthusiastic clerk sold me a carburetor after he had shown me every kind he had in stock. I didn't have to ask him if he had any other kind, right at the start he said "I will show you every type carburetor we have in stock" and he proceeded to do so at once.

Attached to every carburetor was the maker's pamphlet or circular and general instructions so that I could read



for myself just what was claimed for each carburetor. While I was reading through the circulars he waited on two other customers—once I looked up to ask him a

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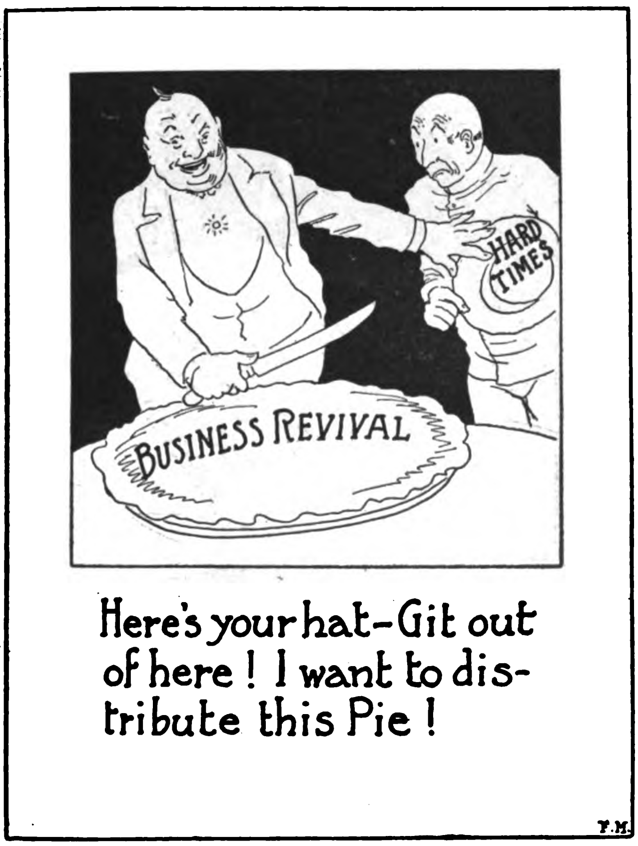
question and he caught my eye and pulled a card out of his vest pocket and handed it to me. On the card was printed: "Stick!—I'll be with you in one minute by the clock." I smiled and nodded, yes.

I found out afterwards that he had three kinds of tickets in three different pockets—one minute, two minute and three minute tickets. He said he could generally tell how near to the finish he was of making a sale. But mostly, he said, the cards were for the purpose of keeping up the close personal touch between himself and the customer.

It was about noon and he accepted my invitation to lunch. I did not explain to him that I was looking for a story about service because he was so interesting that I don't believe that idea was more than a shadow in my mind at the time.

Just as we sat down at the table over in the farther corner of a rather well appointed eating place he said: "I had a peculiar case about a year ago. A man came in who had decided to refit his old car completely. We were talking and looking over the car equipment for about an hour. He had made a generous selection and there was still much that he wanted, but he seemed to hesitate some in making decisions—in fact he began to be a little bit irritated.

"'O!' he said, 'I don't know whether my judgment is any good or not'—quick as a flash I came back at him, 'No!' I said, 'your judgment is not good just at this time nor is mine,' and pulling out my watch I showed



him the time—it was 1:30 p. m. and long past his lunch time and mine too.

"'Now' I said, 'Let's go out to lunch as friends and forget all about business for a while.' 'Well,' he replied, 'that's one on me; I usually eat at 12 o'clock. I'm really hungry, but I didn't know it—I've been so busy.' After lunch we came back to the store and he finished his buying in a much happier mood.

"Sometimes you've got to think not only quick but human. I didn't want to lose that sale and it struck me very forcibly that if I was hungry he must be too—although I didn't know but what he'd had his lunch—but I took a chance and hit the nail on the head. I don't know what I'd do if the same circumstances should come up again with a different slant—suppose a man under those same conditions should tell me that he'd had his lunch, the best I could do would be to offer him a very good cigar, but if he didn't smoke I'd hate to offer him a digestive tablet."

I ventured a question. "What is a clerk's biggest handicap in his efforts to make good?" I inquired.

"Lack of real effort in the right direction—too much push to get to the top of the ladder without paying the price. Too much trying to create power for himself as a salesman. As a matter of fact we do not create power—but unfold it from within. How far do you suppose our country's ambassadors would get if they tried to create power—they don't try to, nor do they dare to, they merely unfold power. Every clerk who is possessed of a mighty passion for assuming, asserting and rising to the level of power is bound to succeed."

"In what way, may I ask, can a clerk start out to unfold this power that is within him."

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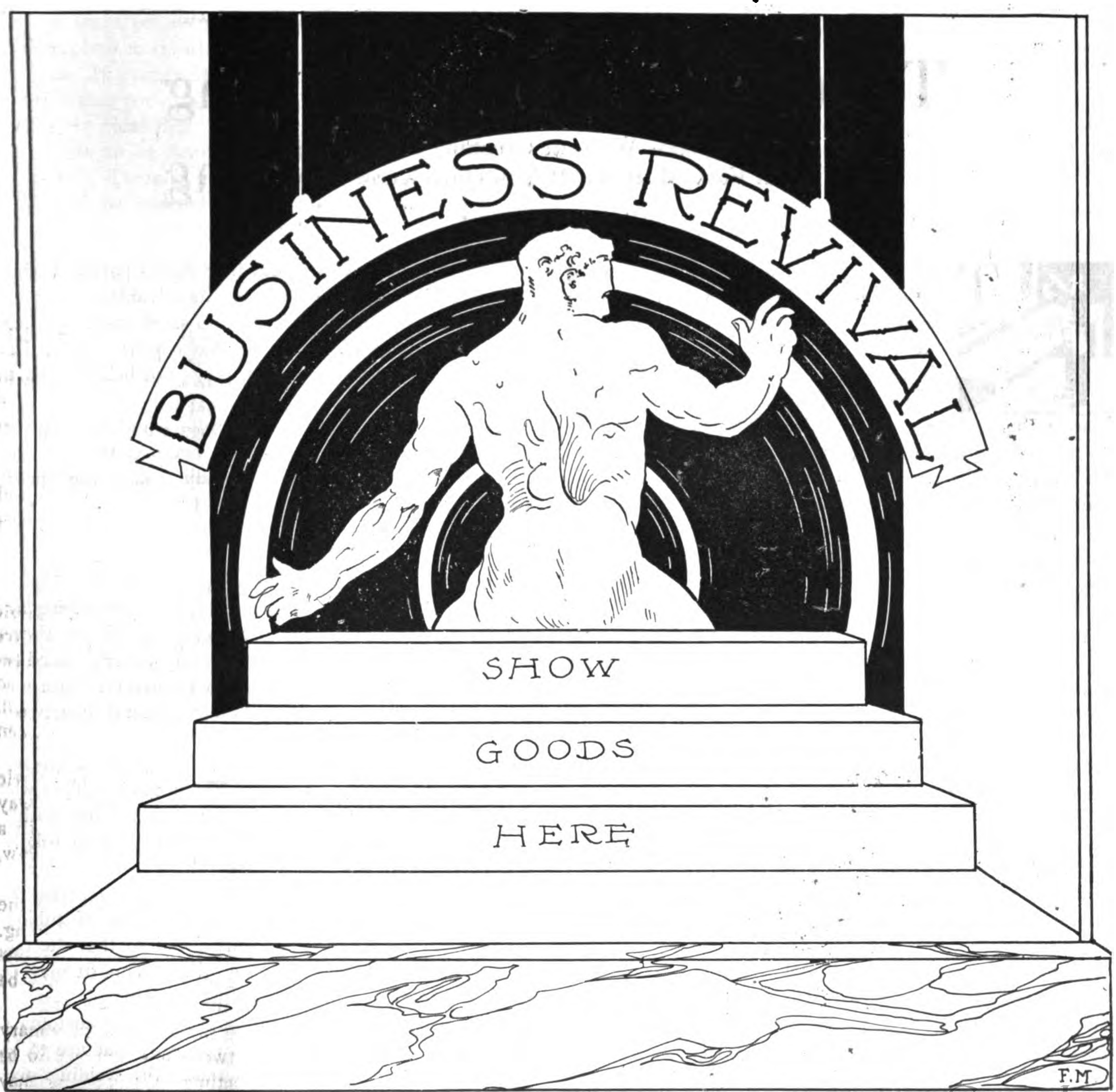
"Just what I told you in the first place—let him treat every customer as a 'soul,' not as a possible crank or someone who just dropped in to ask questions. He must let his good nature predominate under all circumstances—that is his power—to treat people with the same consideration that he would like to receive himself. Show the goods willingly—show different makes of the same articles, work—work—be glad to serve—let him unfold his willingness to serve—let him get rid of the idea that his job is only temporary and that he'll get something better later on—let him understand that his record is bound to follow him, be it good or bad. He may think that anyhow he can cover up a poor record—but he cannot—it will crop out embarrassingly some time when he least expects it.

"The progressive young man cannot too strongly sense the fact that the forces that are going to carry him to his goal are called up inside himself—in his energy—his pluck—his grit—his determination—his good nature—his character. These forces are in every man who stands behind a counter but he must unfold them—not keep them forever locked up. Politeness pays the biggest dividends—it is nature's free capital—the clerk not only should cultivate it—but he *must* cultivate it if he wishes to get to the top.

"Because a man walks in a store to buy something that doesn't make him any different from the man you've never seen before who stops you on the street and asks to be directed to a certain place. This man invariably gets treatment of the polite order—and it's the same man whose hat you'd pick up if it blew off because it had not been nailed down tight enough to his hat-rack.

"Bad manners are the most expensive luxuries in the world. Good manners go farther than letters of recom-



This Business Revival Window Background Can Be Painted Either in Oil or Scenic Color by Any Good Sign Painter at a Moderate Cost.

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mendation. Too many clerks are continually trying to discover just what their life work is going to be and while they are looking on the heights for a glorious career to follow they are neglecting the work at hand."

Here I butted in again with another question. "How is it you are not in business for yourself?"

"Well" he said, smiling broadly, "that's another story. We all have our limitations—as a matter of fact I must have a boss over me for the simple reason that I cannot discipline myself up to the point of what I would exact of others—not that I would actually neglect my work—but I would not work as hard and that's bad.

"We all have our weak spots—I like fishing pretty well—but if fishing interferes with a man's business he might as well buy a good size motor boat with a cabin, stock it with grub and stay out on the water all the time. And that's the very thing I'm going to do some day. Yes—some day when I get to feeling that I don't care whether school keeps or not.

"I am getting the other clerks here pretty well filled with the fact that they must get the 'soul' view of a person if they wish to make progress in any walk of life. I read in the paper the other day of a fellow who claimed that he was a self-made-man. Believe me, I laughed out loud—no man is self-made—what we are comes from contact with other folks. Don't forget that it was a clam bake manager who made it possible for me to earn a salary almost as large as that of the boss. I'm really his business partner, but he would not dare tell me so because he knows that all the fishing tackle stores in town would be sending packages here with my name marked on 'em."

Tube Bending and Welding

Making Bends Without Crushing the Tubing Is an Easy Matter,—If You Only Know How

By J. F. Springer

THERE is a special method of bending tubing which applies to hot or cold bending. One refers, particularly, to the use of a metal spring to prevent the collapse of the tube during the act of curving it in a mandrel or otherwise. The spring may be ordinary wire. The coils are equal, so that the finished spring will fit readily into a cylindrical hole. Such springs are known in the trade as tension springs, since they are put under stress by subjecting them to a pulling action (tension).

But a name counts for little, except to make known to spring makers or sellers just what it is that one wants. The coils should, ordinarily, be close together, if the spring is to be used in tube bending. The spring is inserted into the tube, prior to the bending operation. It should fit snugly. When the tube is bent, the coils resist any tendency to collapse.

Naturally, the stiffness of the wire or bands, used in making the spring, will have to be sufficient to effect an adequate resistance. The material may be steel, hard brass, softer brass, and even copper. If the spring is to be used in connection with hot bending, it will ordinarily be best to insert the spring *after* the heating, so as not to heat the spring more than is necessary. Naturally, a spring highly heated will not have coils that are especially resistive.

A great advantage of the spring is that it may be gotten out after bending, in cases where less than the whole of the tubing is involved in the curving. A solid rod of metal used in such a case to prevent collapse could not very well be pulled or pushed out. The spring, however, is more or less pliable along its length, and so may be expected to come out of a bent tube that is partly straight and partly curved. So much for its advantage over the rod. As to using it in preference to sand, one may point out the advantage of the spring that consists of the fact that it may be very easily used, plugs not being required to keep it in place.

If difficulty is experienced in pulling and pushing the spring out after its bending is over, one may twist as well as pull. With cold work, one may grease the spring before inserting it.

Other Things To Do

It will at times happen that a bent tube is better made of two pieces. That is, two straight pieces of tubing are each bent at one end, say, to an angle of 45° or thereabouts. These two ends may then be properly faced so that, when the two edges are welded together, there will be a single continuous tube with a 90°—bend in between two straight lengths.

If the shop is equipped with a oxy-acetylene or electric welding outfit, the joint may readily be made. This way of making a bend in a tube—or, perhaps, a tube with a bend in it—will perhaps be one of the easiest to follow, provided certain precautions are taken.

Naturally, it will be comparatively easy to make the 45°-bends on the ends of the two lengths of tubing. These may then be very carefully faced so that the one edge will fit squarely against the other. This fit may be called preliminary or not. Let me explain.

With the oxy-acetylene welding process, it is customary to fill in a groove between the two edges that are to be united. But not always. Sometimes, the welding may be done by melting the two edges so that they will run

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together. This may be done by an expert, if the thickness of the metal is not too great, considering the power of the torch. In the present case, the tube edges may not be especially thick and the torch may have considerable power. Under these conditions, the edges may be viewed as sufficiently prepared. The "hot spot" of the welding flame is brought to bear on the two edges and they are melted together all around. The result is that the two pieces are united and a single tube created.

However, if the groove is to be used, then the edges are to be beveled, at an angle of 30°—45°; so that when the two pieces are now fitted together the only place of contact will be where the sharp edges touch. There will, however, be a 60°—90° groove. This is utilized to receive molten metal from a welding rod. And the weld is made thus. However, it is easier to tell it than to do it.

It is needful, not only that the welding rod be melted into the groove, a little at a time; but it is very necessary that the sides of the groove be heated almost to the melting point or even melted, so that there may be a suitable place to receive the molten metal from the welding rod. If proper attention is not given to this point, the weld may prove a bad one.

Another point that is to be considered is, How are the two pieces to be held in position while the welding is going on? There is more than one answer. A plug of wood may be inserted part way into one bent end, and the other bent end may be fitted onto the projecting end of the plug. After the welding, the plug may be burnt or charred out by heating the bend. The wood may be soft or hard according to the conditions.

Tacking Pieces Together

Another procedure depends on the welding torch itself. That is, the welder lays the two pieces on a table with the joint all arranged. Then he uses torch and welding rod in such a way as to put a drop of metal at a couple of separated points, but with both drops right on the joint. The idea is to hold the pieces temporarily. The pair of pieces is now turned over, and one or two more drops put onto the joint. The whole will now be held together by three or four bits of metal—enough, with careful handling, to permit the welding job to be finished.

Instead of putting the joint half-way along the curve, one may use two joints and set them at the two ends of the curved elbow. While this has the effect of doubling the number of joints, it has the advantage of keeping them away from the curve itself. Another advantage—and perhaps a more important one—consists in the fact that with the change of position, the inside of the welds may be cleaned up and any rough protuberances cut off. This is worth considering, as it may seem necessary that the bore may be perfectly clear all the way through the tubing, bend and all.

There is another point that may be mentioned here. In making joints in tubing with the oxy-acetylene welding process, one may often use no metal to fill in the space. This has already been mentioned. There is, however, still another procedure. Extra metal may be employed, but no rod need be held in the hand.

For example, let us suppose that we wish to make a circular weld connecting two straight pieces of tubing or a curved and a straight piece. We may prepare the edges by beveling and in this way provide a groove having an angle of 60° or 90° or more. If now the two pieces are assembled in position on a wooden plug, we may put a ring of welding wire right in the groove. This is all done preparatory to using the torch. The welding may now be done by heating the groove surfaces and the ring and melting all into a single piece of metal. The advantage of this procedure is that it gives the welder two hands with the torch; or sets free one hand to manage the work instead of managing the welding rod.

THE CUT-OUT FOOL

Dr. S. Harper Smith

Some chumps go whizzing along the street,
With noisy cut-outs snorting,
And running here and running there,
Like some mad bull cavorting.
It seems they cannot learn to know,
How sensible people feel,
That the bigger the noise at the muffler,
The bigger the fool at the wheel.

Some people are fools for the want of sense,
And some for the want of money,
And some are prone to make fools of themselves,
In their efforts to be funny.
But the worst of all is the fiend that holds
His cut-out with his heel,
For the bigger the noise at the muffler,
The bigger the fool at the wheel.

I can drive every day, in a quiet way,
With never a sound to annoy;
I whistle a lay, as I hear people say
"His silence is golden; Oh joy!"
The cut-out man should get such a bump
That he would learn to feel
That the bigger the noise at the muffler,
The bigger the fool at the wheel.

Throughout life's game, we find it the same,
That those who are raising a riot
Are not the ones who are earning the "bones,"
But those who work on the quiet.
Wherever we go we find it so,
Its a maxim as true as steel,
That the bigger the noise at the muffler,
The bigger the fool at the wheel.

A New Yorker is a person so ignorant of gardening matters that when you speak of weeds he thinks you are referring to a make of skid chains.—*New York Globe*.

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Automobile Dealer and Repairer

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Stability of Automobile Prices

WITH car prices doing the hop-skip-jump act before our eyes it is no wonder that many of us are so dizzy from their antics that we hardly know when they will quit jumping and begin to fall, or quit falling and begin to jump again. It is mighty confusing to say the least and during the past few months we have been sitting tight, waiting for stability.

The old maxim of "what goes up must come down" has been fairly demonstrated, as far as automobile prices are concerned, during the past nine months. As a matter of fact the coming down has been far more rapid than the going up, likewise it has been more pronounced and it may be that "Truth crushed to earth will rise again."

At the present time automobile prices are much lower than they should be. An "honest value" carries a profit with it and it cannot be said that there is much profit in the automobile business at the present time. Manufacturers, in order to keep their factories going, have sold their cars upon a very small margin of profit, in many cases the profit has been wiped out entirely. It is not reasonable to suppose that such conditions will continue.

Last year we predicted a drop in the prices of cars; this year we predict a rise and though it is difficult to say whether this increase will come within 1921 or not, it is clear to us that new car prices will be higher in the spring of 1922 than now.

In our editorial of last year we developed our reason for the prediction and it has been proven our logic was sound. In this Editorial we are willing to develop the reasons for our present prediction of a rise in prices.

One of the big reasons for the latest drop in prices was that people were not buying cars. Manufacturers, basing their production upon past experience, governed their output accordingly; but still the public refused to buy. Rich man and poor man gave their old cars a tentative brushing over and decided to keep it for another year. Men who formerly have traded in their old cars every year, economized by holding on to last year's machine.

The result is inevitable. The demand for cars next year will be greater than ever before. There will be the normal demand for new machines by those who never before have owned them; there will be the demand on the part of the "regulars" who trade in once a year but neglected to do so this year; and there will be a demand on the part of those whose cars of ancient vintage have cast their last shoe and sputtered its last puff of oily smoke. The demand will equal that of the first few months after the war.

The wise prospect wiil order his machine now because all signs point to the sign that automobile prices, new cars or used cars, are now at their lowest point. All of the air is out of the tires and inflation must commence soon.

Fraudulent Stock Selling Schemes

THE days when nearly every town was honored by a prosperous individual with a carpet-bag load of gold bricks for sale; when the Brooklyn bridge was sold several times a day to credulous visitors to this city and when gold mines were located in most impossible places have passed and the confidence man has turned his abilities to richer fields. The public can be fooled, but the bait must be changed more frequently.

The bait, if we may use the expression, used at present in many cases is the automobile. Every now and then there springs up a concern which bids fair to revolutionize the industry, if we believe what they say. This concern claims to have developed a new type of engine, or perhaps a new principle in carburetion, or possibly a new metal several times lighter than steel.

In glowing terms this company tells of the wonderful possibilities of their product. The story is always the same except that each new concern goes the previous one a few steps better. "A seven passenger car, roomy and comfortable, the speed of an air-plane, the comfort of a feather bed, the endurance of a locomotive, as economical and as cheap to operate as a motor cycle."

The mere fact that the marvel will run from 40 to 50 miles on a gallon is hardly worth mentioning, (but always is mentioned) and as for tire expense; "why, one set of tires will last longer than the car itself."

And on the prospectus is a picture of a graceful machine which looks like an aristocrat. And the prospectus goes on to state that, "By our improved process,

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by eliminating useless parts and by our perfection in design, this beautiful machine can be produced at a lower cost than any car now on the market. We expect to sell it at a profit of about $200 per car and our slogan will be 'a car for every home.'"

In glowing terms the promoters tell about the great demand for such a popular car. Production and sales are spoken of in terms of millions per year. Profits are huge and the only thing, which stands in the way of a fortune is available capital. The benevolent promoters want to benefit mankind in general and are fighting to keep the corporation out of the hands of the trust, they want the public to share in the profits, they want to benefit YOU.

Their zeal toward favoring as many as possible prevents them from letting you invest all you want to, in fact you are not allowed to invest in more than a certain number of shares. (True, later on in the circular they hint that you can invest for your grandfather, your wife, your sweetheart or your children.)

And after the credulous public has snapped up the bait, hook, line and sinker they are hauled in by the benign gentlemen at the other end of the line, stripped of their money and thrown back to bite at another bait.

No, gentle reader, automobile stock never goes begging for owners if it is self supporting and you cannot beat the money game. The future may look promising but beware of the flowery language, immense profits and the wonderful new car which will revolutionize the industry.

Possibly, in your mail tomorrow, you will find a prospectus such as we have outlined. Pick it out with a pair of tongs and see that it is cast into the furnace. Don't read it or you may fall, if you are weak, and if you should, by chance, happen to glance at the imposing picture at the top, remember that this is nothing but an artificial bait for suckers.

I do not mean to state that all new stock ventures are bogus; investors occasionally have made money on wildcat schemes. But my point is that the average man is not in a position to take such a long chance, he should leave it to those men who have plenty of money to throw away or can investigate the matter personally. Play safe.

A B C of the Automobile

The Various Types of Axles in Common Use on Automobiles and How They Are Assembled

By Robert A. Chandler, S. A. E.

ROUGHLY speaking there are two kinds of axles, the dead and the live axles. A dead axle is one which does not revolve. A live axle revolves with the wheel and transmits power to it.

Dead axles are used on the front wheels of automobiles, the rear axles of the chain drive and the internal gear drive. In some other types of rear axles (such as the full floating) part of the housing is extended to make an axle which does not turn and so is really a dead axle, but this is not usually considered as coming under this classification.

Live axles are usually placed at the rear of cars although a few have been designed with power also going to the front wheels, in which case all four are live axles. As the front wheels are used for steering and therefore must be swung on a pivot for turning, it is difficult to deliver power to them. It has, however, been accomplished successfully and in a practical manner, but most designers consider the front wheel drive as unnecessary and too complicated to put on the ordinary passenger car.

Live axles are essentially of but two types, the old style live axle and the full floating, but as the underlying principles of these two may be combined in many ways there are several other types in use such as the semi-floating, the three-quarter floating, and others. The simplest type will be explained first so as to show how its disadvantages have been overcome in the other types.

Let us first consider the old-style tricycle with a chain and sprocket drive to the rear axle. This axle was rigidly fastened to the wheels and so turned with them. All the weight of the frame and the driver rested on the axles in consequence of which it was subjected to two strains: a twisting strain (torsion) due to the power applied to it, and a bending strain due to the weight it carried. Both of these were negligible in the case of the tricycle but are extremely important in the case of the automobile. In a tricycle the parts could be made heavy enough to stand the strain; in an automobile the weight must be kept down.

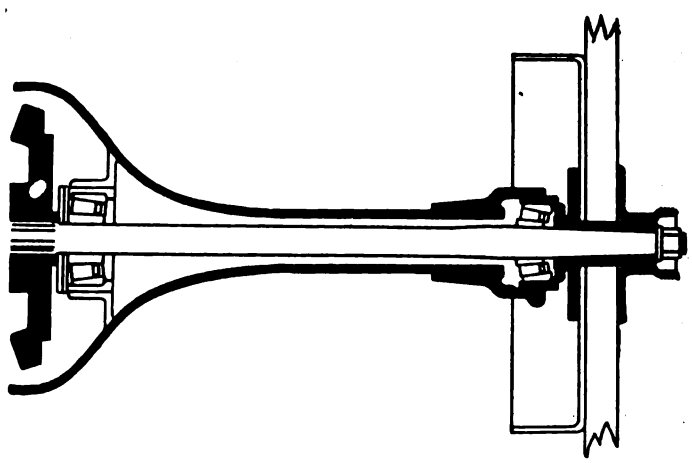

Fig. 1. Semi-Floating Axle.

When automobiles were first designed this type of axle

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was used. It was enclosed in a dust cover, called the housing, but it was the same in principle. The differential was mounted in the center (or nearly so) and the two live axle shafts delivered the power to the wheels to which they were securely bolted. Such a construction required four bearings, two at the differential and one at each wheel. The two at the differential were to prevent the axle from being bent or forced out of place by the force transmitted to the differential. The two at the wheels were to steady the axles at their outer ends and keep them central in the housing.

The weight of the car was carried from the frame to the springs, from the springs to the axle housing, (to which they were fastened on what is called the spring steps), from the axle housing to the bearings, and from the bearings to the axles. The bearings were placed as near the wheels as possible so as to reduce the bending strain, but the essential defect of this type is the dead load on the axle shaft which tends to bend it as it revolves.

The shaft was made large enough to stand this bending strain but this design is not considered good engineering practice. This will be apparent when we consider the way we may break a wire. We may bend it back and forth until the particles crystallize and break. It is evident that a shaft transmitting power should not be bent back and forth at the same time.

But the dead weight of the car is not the only factor to be considered. This strain is increased when the brakes are applied, when the clutch is let in suddenly, by hitting ruts, by striking against rocks or curbstones, but the worst strain comes from skidding. The last effect is frequently ten times as great as that due to the dead weight of the car alone.

It is small wonder that such axles of the type described, broke off short inside the bearings and the rear end of the car came down. Here was a nice predicament! The unfortunate motorist had to locate a truck (a small platform on four wheels) to rest the broken axle upon before the car could be towed.

When this type of axle has to be removed the axle housing must be taken apart and the differential taken out with the two axles fastened to it. The differential must then be taken apart to remove the broken axle. And this is not all. The axle is firmly secured (keyed and pinned) to one of the side gears and frequently an arbor press must be used to separate the parts. When the new axle is obtained all these parts must be re-assembled.

Another weak point is due to the fact that the rear axle housing must be divided. The strain comes on the bolts at the bottom, which have a tendency to strip the threads. The strain is removed in part by a tie-rod running underneath. This will stretch and must be tightened occasionally. This construction is fast passing out of use as it can only be adapted, practically, to light cars.

The Full Floating Axle

In an effort to relieve the rear axle shaft of all unnecessary strains the full floating type has been designed. The differential is supported on separate bearings and so are the wheels: this means that each wheel has an independent support and the axle shaft is not used in any way for the purpose. The axles float between the differential and the wheels without touching the wheel bearings and their only function is to transmit the power from the differential to the wheels. If necessary they can be removed without disturbing any other parts, which means that the differential and wheel adjustments are not changed by removing the axle shafts.

In case one axle breaks the rear end need not be taken down. The wheel stays in place and the car can be towed without any other work than removing the broken piece of axle. When the new axle shaft is obtained it can be easily slipped into place and the rear end is as good as ever. The weight of the car goes from the frame to the springs, from the springs to the axle housing, from the housing to the bearings, from the bearings directly to the wheels, and then to the ground without passing through the axle at all.

Strain on Bearings Minimized

In this design all but the driving strain is removed from the axle shafts, but the bearings must stand the bending strain due to the dead weight of the car, skidding, and the others mentioned above. The axle housing is extended so that it passes through the hub of the wheels, making, virtually, a dead axle. The live axles extend beyond this and clamp to the hubs of the wheels so as to drive them. The housing is not divided but is made in one piece so that there is no danger of breaking at the center, and a tie-rod is generally unnecessary, although it is used on some of the heavier cars. The differential may be removed without disturbing the wheels, but the axle shafts must be taken out first, which is only a matter of a few seconds work. Evidently each part can be inspected, repaired and adjusted, with the least disturbance to the other parts.

Note that the word "floating" is used here in a technical sense. It may be understood as meaning "not touching a bearing." The axle shaft passes through the housing without touching anything. This is why it is called a floating axle.

But some engineers contend that there is too great a side strain on the bearings in this type. Let us see why. A force applied at the tire, pressing toward the car or away from it, would tend to twist the hub sideways. This is prevented by the bearings.

There are two bearings in the hub, one outside and one inside, and they are set fairly close together. As they wear they must be adjusted and so they come still closer together. They receive enormous strains but as there are several rollers in each bearing the strain is divided up among them and so they stand up under it. The whole construction is made heavy enough for the purpose. The fact that this type (the full floating) is used on the heaviest trucks shows that the designers have given it ample strength.

In spite of this fact there are many who prefer a type in which the axle plays a part in steadying the wheel. This brings us to the semi-floating type in which some of the characterstics of both types are evident. The dif-

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ferential is supported on separate bearings and the axle shafts merely fit into the side gears. This is identical with the full floating axle. But at the outer end the axle is bolted rigidly to the wheel, and carries the bearing inside the housing, as in the first type. This gives a greater steadying effect but many of the disadvantages of the old style live axle have been retained. This is offset by making the axle strong enough to withstand the usual shocks.

But axles will break, of no matter what type, and when the semi-floating type breaks, the wheel comes off, if the break occurs inside the bearing and the rear end may fall. If the break is farther in, the wheel may tilt over and the axle gradually work out as the car is towed. If obtainable, a plank is lashed over the wheel to keep the axle in place while the car is being towed, or else the procession is stopped occasionally to allow the rear end to be jacked up and the axle and wheel pushed back into place.

How Wheels Are Secured

In the first type the wheel is kept from coming off by the nut which secures it to the axle. In the full floating type the outside bearing bears against the wheel and is held on by two nuts, one for adjustment and the other a lock nut. In the semi-floating type the wheel is securely bolted to the axle and the axle is held by a collar either at the inner end, near the differential, or just back of the bearing in the housing. This type is not a particularly difficult one to remove but it takes more time than the full floating axle.

But designers like to exercise their brains and so they brought out another type called the three-quarter floating. This axle is used to steady the wheel but carries no weight. This is easily accomplished by extending the housing through the wheel to serve as a dead axle (as in the full floating type) and placing the bearing outside

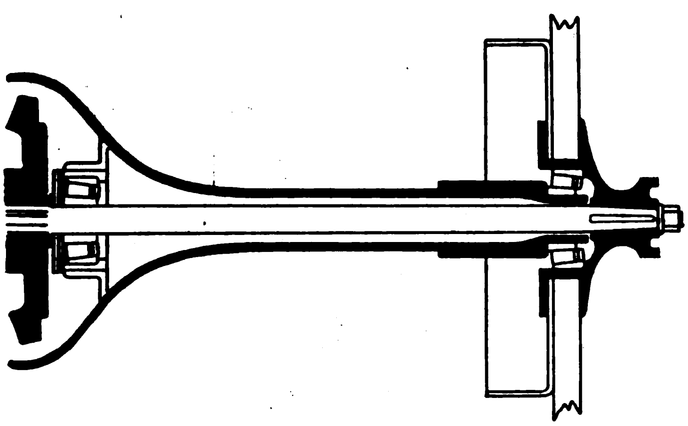

Fig. 2. Three-Quarter Floating Type.

of it. This gives a very rigid construction as the resistance to side strains is taken up between the two bearings (one inside the hub and the other at the differential) nearly half the width of the car apart.

It will be remembered that in the full floating type the side strains are taken up by the two bearings inside the hub, which are very near together. But in the ¾ floating type the axle receives side strains which the full floating type was designed to remove. So the designers of the full floating axle use the simple expedient of fastening the wheel flange securely to the axle and then bolting this to the outside of the wheel. As these bolts are easily removed the axle can readily be inspected or changed.

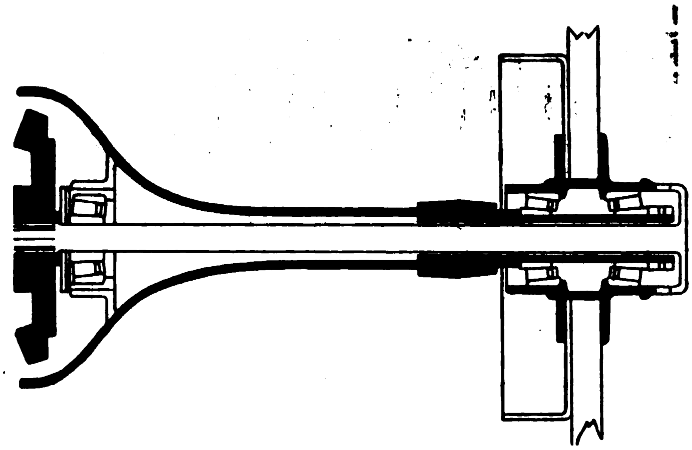

Fig. 3. Full Floating Axle.

This rigid construction uses the axle to steady the wheel in case any looseness develops in the bearings. This seems to be the last word in rear axle design.

AUTOMOBILE SHOWS

November 26-December 3.
Cincinnati, Ohio. Automotive Equipment Exposition. Automotive Trades Association.

November 27-December 3.
New York, N. Y. Automobile Salon.

December 13-16.
Columbus, Ohio. Automotive Equipment Exhibit. The Automotive Trade Association.

January 7-13.
New York, N. Y. National Automobile Show. National Automobile Chamber of Commerce.

January 14-21.
Buffalo, N. Y. Automobile Show. Buffalo Dealers' Association.

January 19-25.
Milwaukee, Wis. Automobile Show. Milwaukee Automotive Dealers' Association.

January 21-26.
Cleveland, Ohio. Automobile Show. Cleveland Automobile Manufacturers' and Dealers' Association.

January 21-26.
San Francisco, Cal. Automotive Equipment Exposition. Pacific Exposition Company.

January 23-29.
Portland, Ore. Automobile Show. Automobile Dealers' Association of Portland.

January 28-February 4.
Chicago, Ill. Automobile Show. National Automobile Chamber of Commerce.

February 11-18.
Kansas City, Mo. Automobile Show. Kansas City Motor Car Dealers' Association.

March 11-18.
Boston, Mass. Automobile Show.

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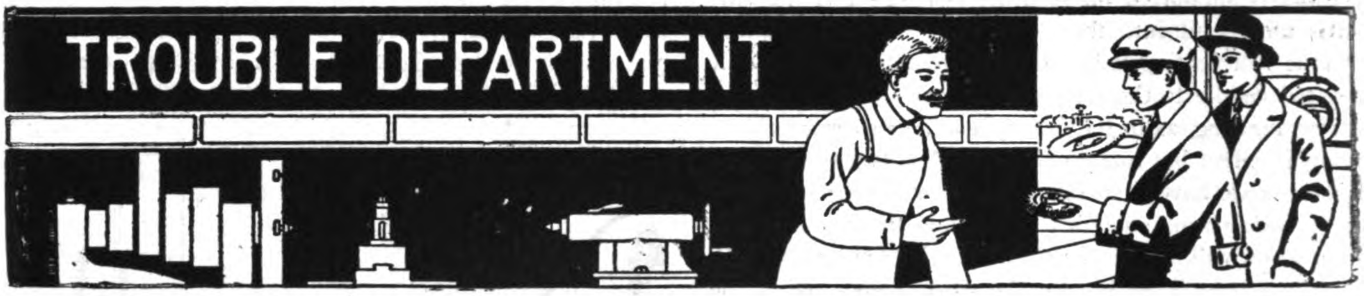


Leaky Piston Rings Again

3037

From C. P. Brown, Massachusetts:— I have an Overland, Model 75B which carbonizes very rapidly. Recently I had the engine overhauled and fitted with patented piston rings but the trouble still persists. The carbon trouble develops before I have run 300 miles. The carburetor is adjusted for a lean mixture. The engine will not hold the car on a hill. What is the valve clearance?

Reply:—From what you say in your letter, we rather assume that there is still a leakage of gas past the piston rings. The fact that the engine will not hold back the car on a down grade is evidence of compression leakage and this coupled with carbonization trouble indicates a leakage past the pistons.

Possibly the trouble is caused by a scored cylinder or possibly the rings were not fitted correctly in the first place. In fitting the rings it is just as essential that the rings fit the pistons at the top and bottom as it is that they fit the cylinder itself. There is just as much of an opportunity for leakage around the rings in back as there is for leakage across the face.

The valve clearance in this car should be the thickness of this paper when the engine is hot. If, however, you set the valve clearance when the engine is cold, set it to the thickness of an ordinary visiting card and check it over after it is heated.

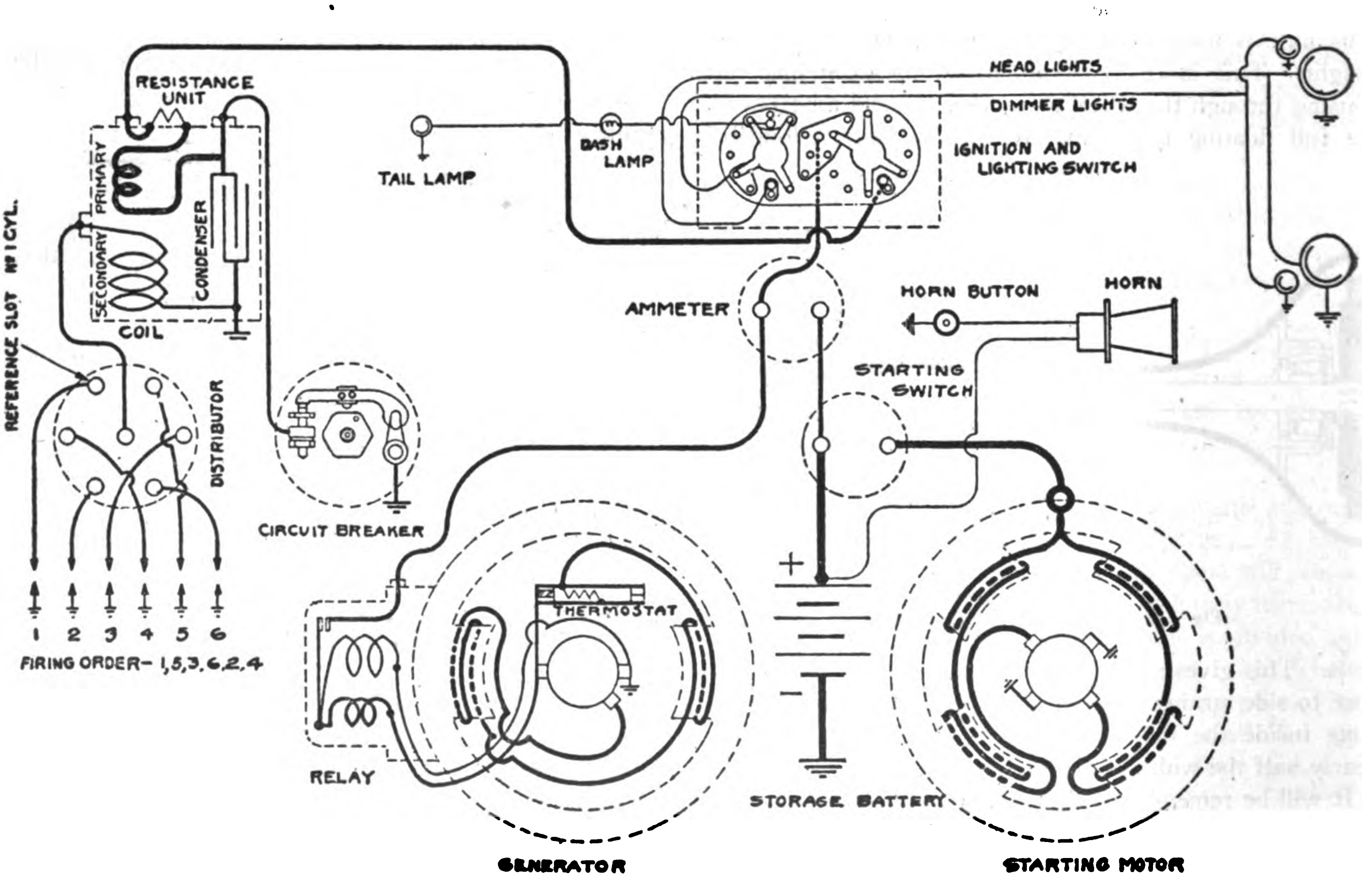
You will find that you will have less carbon trouble if the valves are set with this clearance than if you should set them closer.

Wiring of Velie Model 28

3038

From Walter R. Allen, Ohio: I have a Velie Model 28 car equipped with a two-unit starting and lighting system and would like to have you give me a wiring diagram for it.

Reply: Wiring diagram is given below.



Velie Motor Vehicle Co., Model 28

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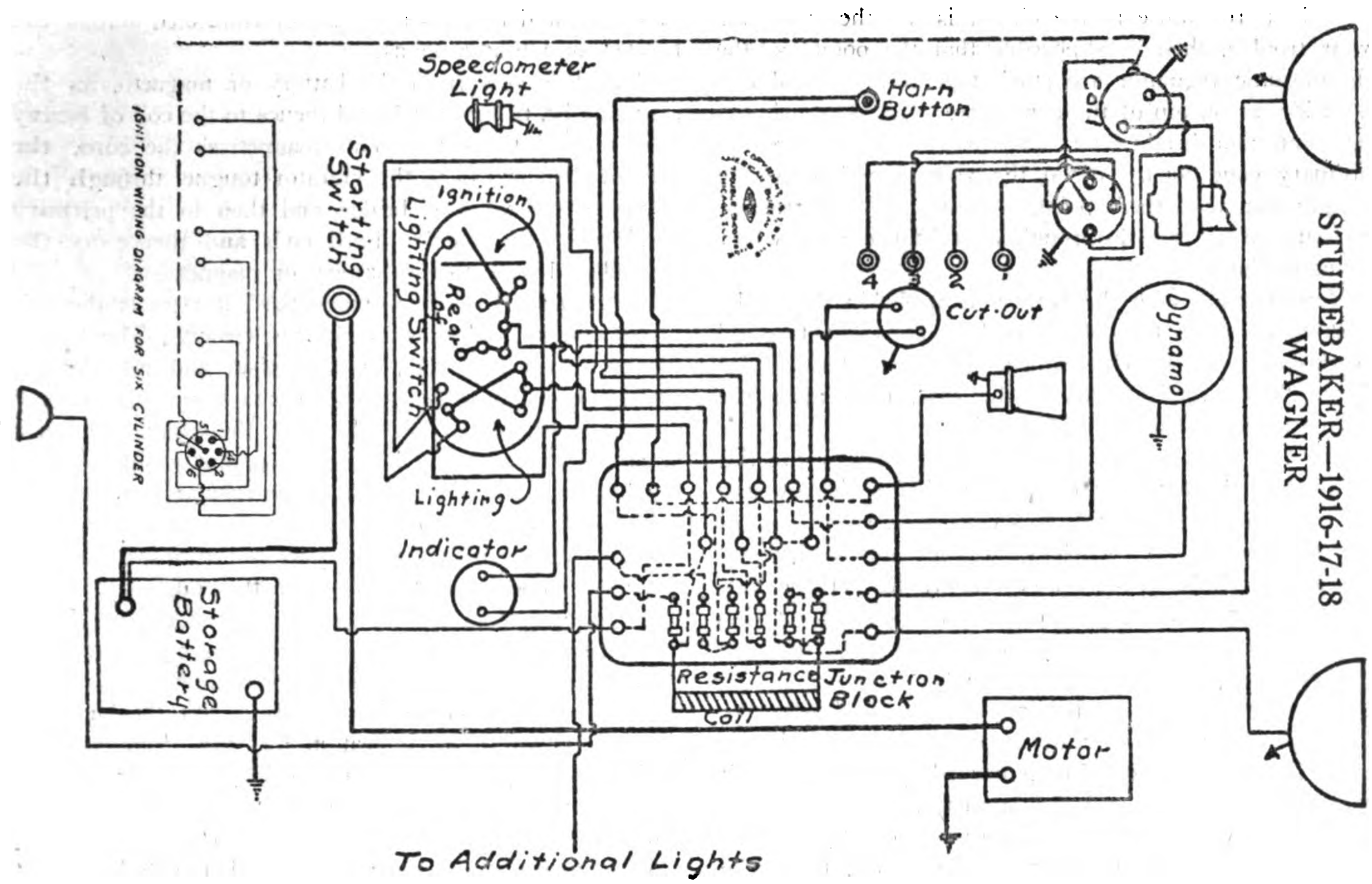

Wiring of Studebaker 1917

3039

From D. A. Simms, Wisconsin: Will you please send me the wiring diagram of the Studebaker Six, Year 1917? This is a Wagner System and has separate motor and generator.

Reply: Wiring diagram as requested is given on this page.

Battery Goes Dead Frequently

3040

From W. A. Snow, Virginia: I have an Oakland, Model 34B roadster and am having some trouble with the battery which goes dead very frequently.

I can take the car out of the garage on one day without any trouble, the starter will work all right, but perhaps the next day the starter will not operate at all and a test will show a "dead" battery. In such cases I have to operate the machine several hours when the battery seems to charge and I will have no trouble for a few days more. And then the trouble begins all over again.

And another thing about the trouble. The bulbs seem to burn out very rapidly. On several occasions I have burned out two or three bulbs, one right after another. A test of the battery, after running awhile, shows from 80 to 90 per cent charge. Will you advise me?

Reply: You have a number of conflicting symptoms in your car. We will take them up in the order in which the troubles should be investigated and remedied.

The burning out of the bulbs is an indication that the generator, voltage output is too high, either all of the time or at certain times. The bulbs will stand an overload for a long time, if the load is not excessive, so that there is no means of knowing whether the voltage is always fairly high or extremely high at certain times.

The cause for an average high voltage is high resistance in the charging circuit. If such a high resistance was between the generator and the lighting circuit, then there would be no trouble caused by burned out bulbs because the high resistance would more than compensate for the high voltage. In your case it is possible that there is a high resistance between the battery and the wire which leads from the ammeter to the lighting switch.

Examine the battery connections and see that the terminals are scraped clean. Possibly one of the connecting straps has been broken or weakened just enough to increase the resistance. See that the battery wires are soldered into the connecting posts. See that the wires are not partially broken and that the connections through to the ammeter are electrically perfect.

There is a big chance for trouble in the battery ground wire or in the grounding of the generator. Note these two points carefully. See that the battery ground wire is connected with a cleaned place on the frame, with a clean bolt. See that the base of the generator and the fitting which carries that unit, are both clean and form a good ground with the frame. It wouldn't be a bad idea to install another heavy cable between the grounded battery terminal and the generator housing. Such a wire would form a good return circuit and obviate any chance for poor connection of the frame members.

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If high resistance in the circuit is not the cause for your trouble, then it is possible that the points in the thermostatic regulator are stuck together. This device is inside, or on top of the generator. The points should be clean and bright and make a good contact under ordinary conditions. When the voltage and amperage is sufficient, then these points separate and the regulating current is passed through a resistance wire which connects the points.

Your trouble with the battery is probably caused by sticking points in the cut-out or "reverse current relay" as this unit is sometimes called. The ammeter will indicate "discharge" if this is the case, even after the engine is stopped and all of the circuits are broken.

For the next few weeks, or longer, make a practice of reading the ammeter every night before leaving the car. If the ammeter indicates discharge, then you can feel fairly sure that the battery will be exhausted unless you can find the trouble and remedy it. If the ammeter indicates nothing on either the charge or discharge side, then you can be reasonably sure that the battery will not discharge itself.

If you find that the battery discharges, despite the fact that the ammeter reads zero, then the trouble is either in the battery itself or is caused by a short circuit between the battery and the ammeter. The short-circuit, which will be in the form of a grounded wire is easily remedied. If the battery is at fault, then take it to the battery service station.

Master Vibrator Trouble

3041

From A. M. Gordon, Connecticut: I have an old Ford car upon which I installed, several years ago, a master vibrator. Of late the machine has been giving considerable trouble and I finally traced it to the ignition system.

For a long time I was of the opinion that the ignition trouble was due to a fault in the timer or the wiring, but finally the car quit work entirely and as a last resort I cut out the master vibrator entirely and operated the car on the regular coils. The engine ran fairly well under these conditions. I tried to make some repairs to the master vibrator, such as installing new points, adjusting them, etc., but the minute the unit is put in the circuit as it should be, then the engine gives trouble.

What would you advise me to do? Should I try to fix the vibrator myself or should I send it back to the makers? Do you think the unit is burned out?

Reply: The master vibrator is a very simple unit and as a general rule such a device outlasts several cars unless excessive current is sent through it. Occasionally, however, some defect develops and in such cases the device should be sent back to the manufacturers.

Before sending your vibrator back to the maker, however, it will be best for you to conduct a few experiments. In order that you may understand the construction of the device we will outline it to you.

The whole thing is built much the same as an ordinary electric bell, except that the magnet is single instead of double and there is a condenser connected across the breaker or vibrator points.

Current passes from the battery or magneto, as the case may be, to the switch and thence to the coil of heavy wire around the core. This magnetizes the core, the current then passes to the vibrator tongue, through the points to the vibrator bridge and then to the primary winding of the regular Ford coils and thence to the ground and back to the battery or magneto.

As soon as the core is magnetized it attracts the vibrator tongue and thus breaks the circuit. The break in the circuit cuts off the magnetism and the tongue springs back to make another contact and the whole process is repeated. The object of the master vibrator is simply to make and break the current rapidly so as to generate a secondary spark in the regular Ford coils.

The breaker points or vibrator points of the master vibrator are connected with condenser terminals. The condenser is sealed in the box with the coil.

In making your experiments you must connect both terminals of the master vibrator with a six volt battery. First see that you can get a good, clear hum or vibration from the device. If the hum is shrill, like the buzz of a wasp, then it is an indication that the contact screw in the bridge is screwed down too tightly. If this is the case unscrew it. You may find that this breaks the connection and so you will need to bend the tongue upward and away from the magnet so that it will have a wider vibration space.

The tongue should have a space to vibrate equal to the thickness of a thick business card. If the hum is broken and ragged, it indicates a weak spring and a new tongue is necessary. If the tongue sticks it indicates a short circuit.

If you do manage to get a good clear buzz from it, notice the points. If you find that there is excessive sparking across the points, it is an indication that the condenser is broken down. If the condenser is shorted inside, the tongue will stick to the magnet.

If you cannot adjust the device to give a good clear hum without excessive sparking, then send the coil back to the maker.

Ammeter on Pullman Car

3042

From Anthony Kinley, New York: Will you kindly tell me where to connect an ammeter, to show charge and discharge, on a Pullman, 1916 car?

Reply: Our records indicate that there were two models put out in 1916 by the Pullman people. Ammeters may be installed according to the following directions:

The first model was equipped with a 6-12 volt battery and there are four wires from the battery to the starting switch. Examine the connections from the battery to the starting switch and you will find that one of the positive wires connects with a terminal in the side of the starting switch. From this connection a wire leads to a fuse box on the dash. Cut this small wire and insert the ammeter in the line at any convenient point.

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The second model was fitted with a 12 volt battery which has three connections, two main leads to the motor-generator and ground and a third to the horn.

On this model the positive lead wire from the battery to the starting switch is also connected by a small wire to the switch box on the dash. This same small wire also leads back to the motor-generator. This wire should be disconnected for the lighting and ignition switch and the ammeter inserted between the end of the wire and the switch.

Clots in Lubricating Oil

3043

From C. A. Johnston, Pennsylvania:—I have an Overland roadster, 1920 model which has been run about 3000 miles. A few hundred miles back I noticed that the oil indicator did not function properly and in making the repair to this I removed the bottom of the crank case.

There seemed to be plenty of oil but the oil was full of soft, black clots. These clots had clogged up the indicator. I have been using Veedol exclusively and this is the first time I have encountered this trouble. Can you tell me the reason for this trouble?

Reply:—We are at a loss to account for the clots in the oil and this is the first time in our experience that we have encountered such a peculiar action.

We can see but one way to account for this trouble and that is that possibly some of the pistons contain pockets at the top where the oil may remain for some time. Under these conditions the oil will heat and distill until coal tar and carbon are formed. The combination probably is such that the product is not soluble in the oil itself. Sooner or later this mass breaks away from the inside of the piston and works into the base again.

We do not know what to advise you in this case because of its uniqueness. Under ordinary conditions we would have no complaint against Veedol. We have always found it to be an extremely good lubricant and this is the first time that trouble has been encountered.

It is very possible that at one time or other a garageman poured some poor oil into the crank case; an oil which tended to clot up when combined with the Veedol.

Wiring on Oldsmobile Model 42

3044

From Otto S. Schmidt, Michigan: In making some repairs on my 1915 Oldsmobile, Model 42, the wiring was dis-arranged and I cannot find the proper connections. Can you furnish me with the wiring of this car?

Reply: A wiring diagram of the Model 42 Oldsmobile is given below.

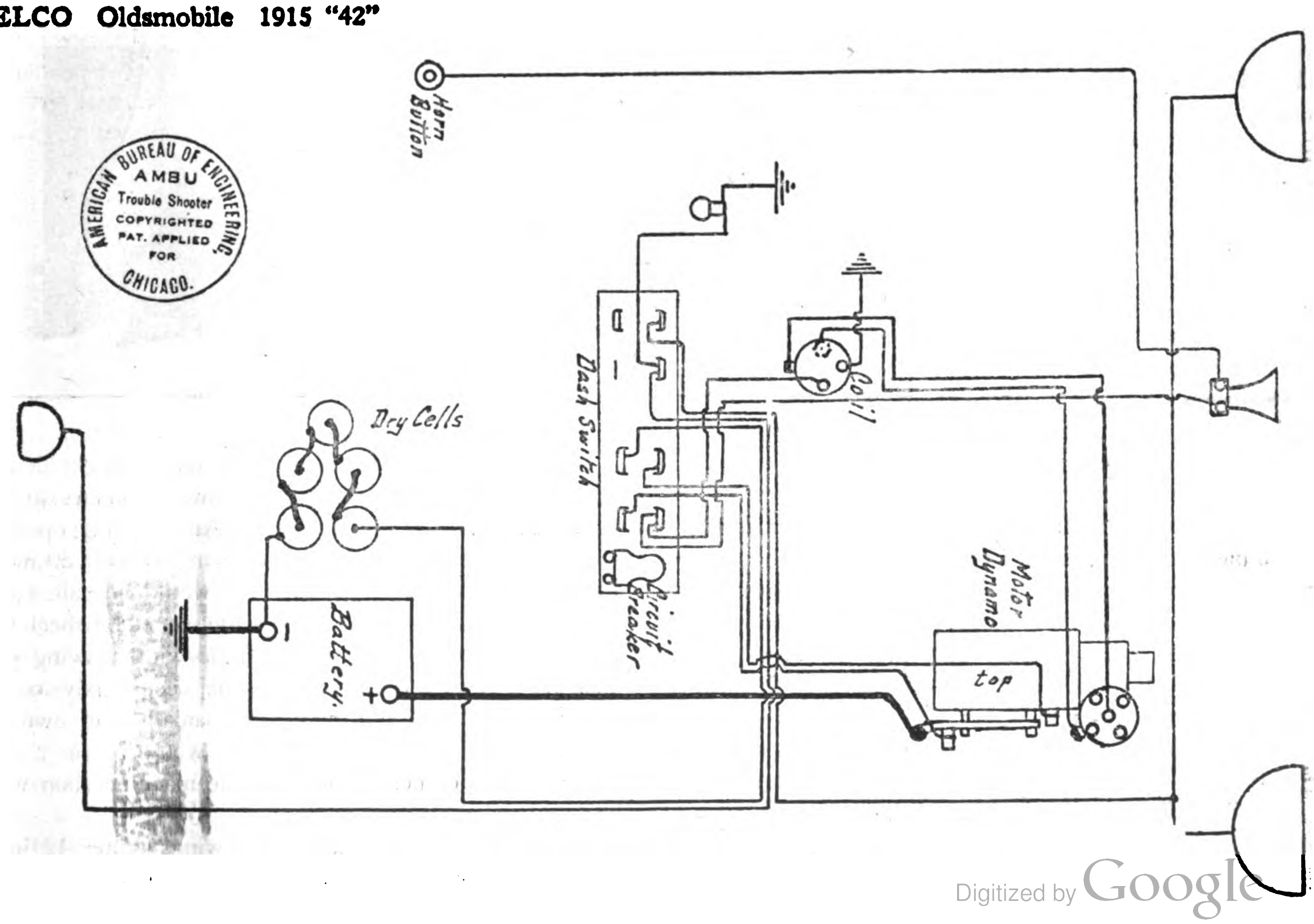
CHEAPER AT ANY RATE

FIRST MOTORIST: I had a drink of real moonshine the other day.

SECOND MOTORIST: How was it?

"I find that I can get about the same result if I kiss a spark-plug when my motor is running."—*Life*.

DELCO Oldsmobile 1915 "42"



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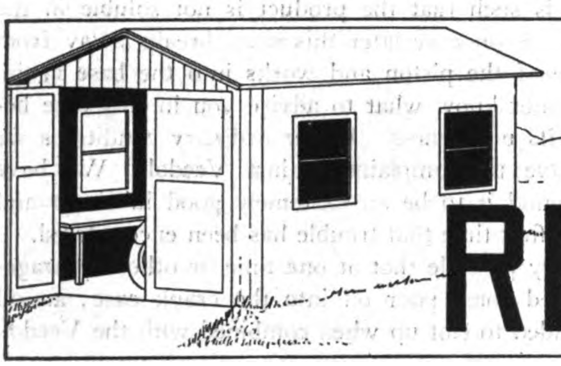
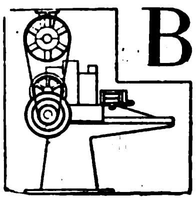


OUR OWN REPAIR SHOP



BEFORE we enter into the discussion of the various units of our own machine shop we wish to make one point entirely clear in the mind of our readers. We do not stand in the position of recommending any particular make of machine or discriminating against any other. Our readers must not gain the impression that because we have a certain machine we consider it the *best*. We have tried to install representative equipment and though we feel that each machine in our shop can be considered excellent, we also know that there are other machines in the same class.

In selecting our machinery we tried to obtain satisafctory equipment. Certain conditions, having nothing to do with merit, arose to make the machines, which we acquired, more available. The reader is not to be influenced by our choice in the least, though if he should consider the purchase of any of the machines similar to those which we have, he can rest assured that he will obtain satisfaction. Our department was inaugurated to demonstrate the utility of each type of machine, not the machine itself.

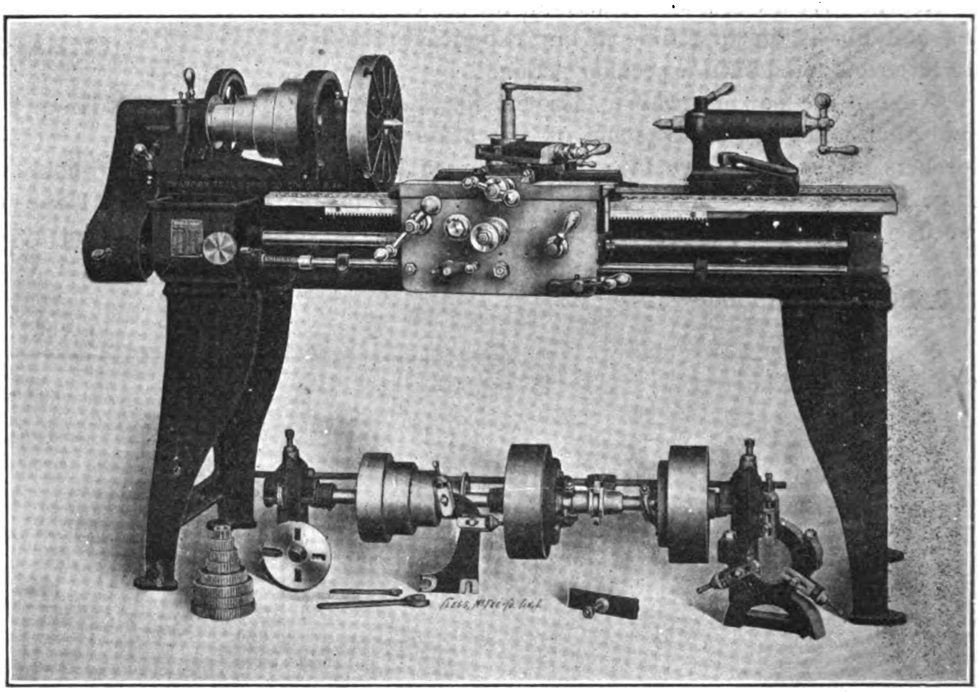
A machine or automobile repair shop without a lathe is like a steam engine without a boiler; the lathe is not merely a convenience but a necessity. The lathe is the one tool which cannot be omitted from the shop.

It has been said that the modern milling machine is a complete machine shop in itself and that there is no machining job which cannot be done upon it, within reasonable limits of course. As far as automobile work is concerned the writer would state that the lathe fills all of these specifications and doubtless many of the readers are of the same opinion.

Except for the milling machine, which is an expensive tool, there is no one machine of such utility as the lathe. Upon the lathe may be done any kind of machine work if the operator is possessed of an ordinary amount of ingenuity.

Ordinary turning, screw cutting facing off, drilling, and grinding are considered as typical lathe jobs. Gear cutting, splinign, reamer fluting, tap making, rack cutting, relieving and small jobs of planing are possible, with suitable accessories, in the lathe. As time goes on it is our purpose to consider these various "special" operations in the columns of this magazine.

The size of the lathe is of paramount importance to the repair man. The first cost of a lathe large enough to do all of the automobile repair jobs is not much greater than that of one too small.



12-Inch by Six-Foot Champion Lathe.

The only parts of an automobile which might demand a lathe with a swing of more than ten inches are the wheels and the engine flywheel. Any turning operation upon the wheels would require a swing of over 30 inches, but the chance that a repair shop would be called upon for a job of this kind is very remote. A flywheel turning operation would require a lathe with a swing of at least 18 inches, but this job might occur only once a year and it would hardly pay the small shop owner to consider such a rare possibility. It would be far cheaper for him to take such a job to some machine shop where he could utilize a larger lathe.

As a general rule lathes with swings under 12 inches are of light construction whereas automobile repair work

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often is fairly heavy. To withstand the heavy duty the lathe should be strong enough to make a heavy cut without chattering. And considering these facts we decided upon the 12 inch swing lathe as being the nearest ideal for a small shop.

Our machine is made by the Champion Tool Works of Cincinnati, Ohio and what might be termed the "last word" in lathes, in that it is equipped with all modern devices for facilitating work. Its general dimensions may be considered as conforming with the standards of construction so that special tools and accessories may be purchased at any time. And, finally, it is heavy enough to withstand the usage to which it may be put in automobile repair work.

Length of Great Importance

The length of the lathe bed is an important item to consider because of the fact that many units of the automobile require a long turning distance. Axles, propellor shafts and cam and crank shafts are regular repair jobs. If the lathe is not long enough to do machining upon these units, the repair man is sadly handicapped. Unfortunately we were limited as to floor space and for this reason we chose the lathe with a five foot bed. Had we contemplated making actual repairs as a business, we would have chosen the eight foot machine.

With the five foot bed the distance between centers is but two feet, seven inches. The eight foot machine would give a turning length of approximately six feet and would have cost but little more in comparison with the total cost. Practically every lathe manufacturer is in a position to furnish lathes of this length.

Although we are limited somewhat by the short bed and are not able to machine crank or cam shafts, we can turn shafts up to 1 1/16 inches in diameter of any reasonable length of running them through the hollow spindle in the head. For rough turning on shafts of greater diameter and greater length than the 2 ft. 7 inches, it is practical to mount one end in the chuck and support the other end upon the steady rest.

By this latter arrangement it would be possible to rough turn a shaft five feet in length and to do a creditable job at finishing off either end.

The Lathe Head

The lathe head is very solid. The spindle is mounted on a 2 1/16 inch by 3 3/8 inch bearing at the front and a 1 11/16 by 2 7/8 inch bearing at the rear. The first dimension in each case being the diameter. The hole through the spindle is 1 1/16 inches in diameter.

The spindle is fitted with a four step cone for two inch belt and this cone is accurately balanced and machined on the outside. The small step is 3 1/2inches in diameter and the large step is 8 inches thus giving a fairly large range of spindle speeds on the direct drive. With the back gears in a further reduction of 8 to 1 is possible.

The countershaft is fitted with a well finished cone pulley and two, 10 inch, clutch pulleys. It is planned to run the first clutch pulley at 150 R. P. M. and the second at 200 R. P. M. This will give a range of spindle speeds between the lowest of eight R. P. M. and the highest of 460 R. P. M., approximately.

We feel that this large range of spindle speeds is worthy of note since it provides for everything from a heavy roughing cut to medium speed for polishing. And should it happen that the shop is called upon for a job of wood turning, the speed of 460 R. P. M. is sufficient for the purpose.

In a later article we will discuss the various methods for driving this machine with the idea of suggesting a plan whereby the lathe may be driven at practically any speed within reason, consistent with the driving power.

Next to the head, in importance, comes the carriage. A lathe may be said to be no better than its carriage and surely it is true that the work may be sadly limited by a poorly designed apron.

The apron on our lathe is large and solid and is bolted to the carriage is such a way that it is practically integral with that member. Thus the chance for lost motion is minimized. Upon reference to the cut of this lathe one will see that the arrangement of carriage control is along "standard" lines. At the left, near the top of the apron is the manually operated crank, working through a rack and pinion for moving the carriage longitudinally.

Rack Movement Can Be Dis-Engaged

The pinion of the manual crank is mounted upon a moving arm which is controlled by the lever immediately below and shown in the lower left-hand corner of the apron. By depressing this arm, the pinion is dis-engaged from the rack when the machine is being used for screw cutting.

At the middle of the apron is located the rack and pinion locking devices for use when an automatic feed is required for turning. This lock works upon the rack and pinion only. The lever located at the right center of apron is for closing the split nut over the feed screw. This cannot be operated if the automatic feed is engaged.

Below, and in the lower right hand corner is the lever for meshing the apron gears. This lever may be placed in either of three positions and when the rack and pinion is in operation the carriage will automatically move either to the left or right as desired. The gears are so arranged that they may be meshed without stopping the lathe.

The carriage, when used for turning work is moved either through the manually operated crank, or automatically by the apron gears and these latter are actuated through the rod located below the feed screw. The feed screw is not used except in screw cutting.

The lateral or cross carriage is operated by the crank at the top of the apron. This carriage also has an automatic drive and by pulling out a knob at the side, the apron gears are meshed and the carriage moves laterally. The lateral movement of the carriage is reversible through the lever at the lower right hand corner of the apron. Either the cross or longitudinal feeds may be operated automatically, singly or together.

Mounted on the lateral carriage is the compound car-

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riage which carries the tool post. This carriage is fitted with a dial, which indicates in degrees, the angle of its position in relation to the lathe centers. The dial is graduated the full 360 degrees of the circle.

Both the lateral and compound carriage cranks are fitted with micrometer indicators reading to 1/1000 of an inch. The average mechanic would be able to set the compound carriage to 1/2000 of an inch and the lateral carriage to 1/4000 of an inch with a little practice. Both of the micrometer thimbles may be set to the zero point regardless of the carriage position. The tool post on this machine takes a lathe tool of 1/2 by 1 1/8 inches.

The cross carriage travels to the capacity of the machine and the compound carriage has a movement of 2 7/16 inches.

For screw cutting the lathe has a range of from 2 to 96 threads per inch, including 11 1/2. This range includes practically all of the American machine screw standards, stove bolts, S. A. E. and pipe threads. We understand that the manufacturers are prepared to furnish the machine for metric threads also.

The change gears are held by means of nuts and keys. Our lathe is provided with semi-quick dial by means of which three different threads may be cut with one set of change gears. Naturally the speed of the carriage can be varied through the same change gear mechanism. This gives a wide range of carriage feeds.

The rod feed for the carriage is so arranged that, by the setting of stops, the carriage may be automatically stopped at any point. A lever in the change gear box controls the direction of the carriage and screw feed. A chasing dial on the carriage, operated through the threads without stopping the lathe or reversing it.

The tail stock is of conventional design with calibration on the rear for normal taper work. A large and small face plate, steady rest and countershaft complete is the regular equipment.

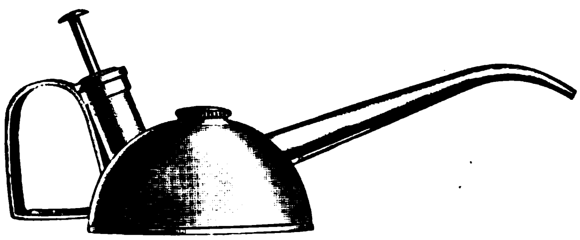
The ten inch chuck, the drill chuck and the lathe tools will be taken up in a later article of this series.

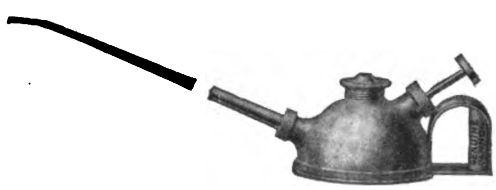
New and Useful Automobile Accessories

The Cannon Pump Oilers

The Cannon Oiler Company of Keithsburg, Ill., announces the manufacture of two new types of Pump Oilers for the Automotive Trade which have features of exceptional interest.

Their new Standard Automotive Type with detachable spout is said to do away with an annoyance common to Oilers of this variety. The design includes an arrangement of the valves in a horizontal position submerged at the very bottom of the Oiler and this insures that the





Pump Valves will always operate properly as they are constantly primed.

A unique point brought out in their circular matter relates to the horizontal position of the valves, a feature exclusive in these Oilers (and this arrangement does away with any possibility of the valves being jarred off of their seats).

The Oiler Body is drawn one piece of heavy steel and copperized and instead of the ordinary rolled or pressed thread for the oil opening and cap construction they are using a large cut thread screw machine cap and neck. This should last a lifetime. A screen is arranged at the top of the Oiler to eliminate foreign substances going into the body of the Oiler.

The spout connection to the discharge cylinder is unique. This is made by means of a heavy threaded cap and the spout is not only supported by its flanged base but internally supported by a protection from a discharge cylinder.

The Body Bottom is double seamed and the handle is attached in the conventional way. A special feature of this Oiler lies in the use of all brass pump cylinders and discharge pipe as well as the valve seats and springs. In operation light thumb pressure on the plunger forces out a drop or tablespoonful of oil depending on the length of the stroke of the piston.

These Oilers are of great convenience in reaching hard-to-get-at-bearings since the oil may be pumped out of the spout regardless of its position. It will pump oil even vertically, and will handle the heaviest oil under any climatic conditions. They are unconditionally guaranteed.

This company has also produced an Oiler for the Automotive Trade with a fixed spout known as their Handy Auto Oiler. This differs from the Oiler described above in that it is furnished with a brass filler cap of pressed thread instead of the heavy screw machine thread cap of the above described Oiler.

The valve construction is similar to the Oiler construction outlined above excepting in regard to point of location. The Body and Bottom are drawn one-piece and double seamed making a thoroughly rugged and dependable Oiler and its ability as a Pump Can is thoroughly guaranteed.

It is believed that the new Handy Oiler described is the lowest priced Automotive Pump Oiler on the market and we can assure our readers that both the Standard Automotive Types and the Handy Oiler are manufactured by the pioneer manufacturer of Pump Oilers in the world.

Reduction in Body Prices

The Bud Body Corporation, 338 South Water St., Milwaukee, Wis., recently announced a substantial reduction in the prices of the Speedster type bodies which they manufacture.

These good-looking, well made bodies entirely change the appearance of the cars to which they are added, and the reduction in price should make every Ford owner anxious to investigate their qualities.

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Is this man saving your dollars?

Are you getting 100% service from your oxy-acetylene equipment?

Do you realize that the welding and cutting blowpipes will remake defective castings, rectify shop errors and cheat the scrap-pile?

An oxy-acetylene welded part is not reclaimed—it is *remade* and is ready for 100% service.

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in easily portable cylinders enables you to expand the use of oxy-acetylene, at will, to any department of your factory.

Quickly taken to any job, anywhere, the Prest-O-Lite cylinder supplies uniformly pure gas where and when it may be needed.

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The Ambu Hydrometer

We have just received from American Bureau of Engineering, 1603 So. Michigan Ave., Chicago, Ill., one of the cleverest little devices it has been our lot to examine for some time. The device we refer to is a battery hydrometer, but different from any other we have ever seen. The feature of this hydrometer is that it can be "read' in the semi-darkness.

The new Ambu Hydrometer is only six inches long and consists of a bulb, a filling nozzle of rubber and a glass body. Inside the glass body are three colored balls and this is all; the simplest hydrometer possible.

The inscription on the box tells how to use the device and is clever. This inscription reads: "Floats all three, charged full. Sinks the white, charge all right. Sinks the green, charge is lean. Sinks the red, charge is dead."

The car owner doesn't need to remember battery gravities or anything like it with this hydrometer. Red is danger; green is caution; white is all right and everyone can remember these signals.

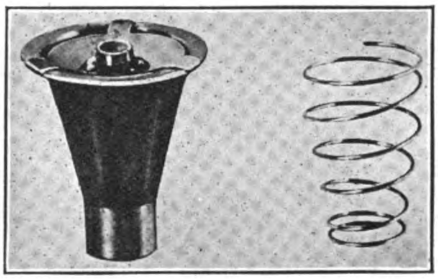
The hydrometer is fitted with a square piece of rubber at one end as a protection.

New Pyrene Product

Any new device which promises the motorist further economy in the operation of his car is welcome. And when that device is sponsored and guaranteed efficient by an organization with a national reputation, its announcement can be taken without the proverbial grain of salt usually taken to discount the manufacturer's commercial enthusiasm.

In this case it is the Pyrene Manufacturing Company, makers of Pyrene Extinguishers, who, over a long period that only a large organization could afford, have completed a series of experiments with a gasoline saving device for the Holley Carburetor used in the Ford.

It is named the Simpson Flexeco "30"



and consists of a brass cone-shaped device and a spiral spring. The object of the device is to break the gas up into the finest possible vapor and thus improve the operation of the motor.

At 20 miles per hour the position of the Flexeco "30" would be as shown in the illustration, some vapor passing up through the chamber inside the cone, and more vapor whirling up around the outside of the cone. The vapor passing through the inside of the cone is thoroughly broken up by slot-shaped ports. The vapor passing up on outside of cone is broken up by whirling motion and by striking the deflection flange at the top of the cone.

At speed greater than 20 miles per hour, the cone lifts still higher, due to increased suction from the motor, and allows an additional amount of vapor to pass up around outside of the cone.

At slow speed, the spiral spring holds the cone down so that the flange at the top of the cone rests on the shoulder of the carburetor chamber thus closing the opening around the cone and forcing the vapor to pass through inside of the cone.

This device is said to automatically regulate the gas mixture, so that maximum efficiency and gasoline saving is being obtained at all times thus increasing the mileage 30% to 50%. The Company gives an unqualified guarantee of 30% or more.

When all these features were proven to the full satisfaction of their own and retained experts, the Pyrene Manufacturing Company sent the device to the various technical colleges for tests by disinterested authorities. At the expiration of the lengthy period usually taken by such institution to make an exhaustive test and give an opinion, the manufacturers are now learning of the good results that surprised them in the first tests being duplicated and endorsed officially by technical colleges.

The Polytechnic Institute, Department of Mechanical Engineering, conducted a series of Ford road tests with a Holley Carburetor equipped with and without the new device.

K-M-Windshield Wiper

Announcement is made by the K. M. Manufacturing Co., of Toledo, Ohio, of a distinctly different type of mechanical windshield cleaner that will fit any type of windshield on any car manufactured in any desired position and designed to be sold at a moderate cost.

It is claimed by the manufacturers that the purchaser has the choice of interchangeable wipers of three distinct types, rubber, felt, spring-brass.

The spring-brass wiper is designed for use on the outside glass, the thin spring blades cutting in the direction of movement, actually getting under and removing ice, sleet and frost instead of merely dragging over such obstructions. The spring-brass blade wiper is used in combination with felt wiper on inside of glass.

Where felt only is desired an especially thick pad is made for the outside of glass, and is used in combination with a thinner felt wiper for the inside of glass. The felt wipers are chemically treated and it is claimed one wiping will prevent the rain and other moisture from forming in beads, causing the same to run off and leave the glass clear during the entire storm.

Thomson's Speed Band Renewer

One big problem confronting drivers of Ford cars has always been to elminate "chattering" in Ford speed bands As everyone familiar with Ford mechanism knows, the speed bands run in oil. After three to five days of driving, with shifting speeds and applying the brake, the speed band gets a hard, glazed surface due to the heat of friction burning and crystallizing the oil on the bands. After that the brake grips just like steel on steel, causing "chattering" and shaking and when the foot-brake is applied hard, occupants of the car are thrown forward by the sudden stop as the brake seizes.

To overcome this "chattering," a new preparation, known as Thompson's Speed Band Renewer, has just been placed on the market. It is a liquid compound and is manufactured by the Thomson Auto Specialties Company, of Columbus, Ohio, who are well-known as makers of automobile oils and other preparations.

Thomson's Speed Band Renewer is easily applied. The maker recommends that the crank case be drained of oil before applying, but this is not absolutely necessary. The driver removes the transmission cover and loosens the speed bands. He then raises them off the top of the drum with a screw-driver and pours about one ounce of the Renewer on top of each band, so that it runs all around. The speed bands are then tightened and the gears and brakes should be worked hard. This "treat 'em rough" usage spreads the Renewer and soaks it into the hard glazed surface of the bands. The solution dissolves the crystallized oil and softens the band to its original pliability.

Thomson's Speed Band Renewer is sold in 10 oz. cans. Each can contains from one to three applications. For service station use, it is put up in gallon containers. It may be obtained from distributors everywhere and the Thomson Auto Specialties Company is appointing new representatives to facilitate the distribution of this new and highly successful preparation.

The Scintilla Magneto

The Scintilla Magneto Co. Inc., of 225 West 57th St., New York City, are marketing a magneto which is said to be built upon an entirely new principle of design The magneto is unique in that the permanent steel magnet and the breaker cam are the only rotating parts of importance.

In general the whole machine is enclosed in a dust-proof housing. The distributor brushes, breaker box and points are entirely accessible for inspection without disassembling the machine. This means that all adjustments can be made very easily.

The primary and secondary coils as well as the condenser are all wound upon one spool which is located at the top of the magneto and this unit can be removed by unscrewing the two screws which hold it to the pole pieces.

In order to time the device with the engine it is only necessary to open a shutter at the top and watch for the number "I" to appear at the window. This number indicates that the distributor is over the contact to number one cylinder and that the breaker points are just separating and that number one cylinder should be set to fire. The rest of the timing takes care of itself.

All dimensions of the magneto are according to S. A. E. standards and the machine can be attached to any standard type of engine. The Scintilla is made for single, two, four, six and eight cylinder engines, of all sizes.

Acme Windshield Visor

There are many features of the Acme windshield visor, sold by the Acme Motor Shield Corporation, of 1819 Broadway, New York City, which are attractive and which would indicate that the device is a practical one.

It is built on the principle of a window curtain, and can be rolled back against the top of the windshield instantly. Metal arms on either end of the Acme hold the visor in place when it is extended. They can be folded back out of sight when the visor is rolled up.

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Solves Every Piston Ring Problem

It was John E. Norwood, inventor of the No-Leak-O Piston Ring who discovered that an "ordinary" piston ring would not give maximum compression and perfect cylinder lubrication.

And so he devised the original, "oilSEALing" angled groove of the No-Leak-O Piston Ring which maintains a perfect non-leaking oil seal between piston and cylinder wall, and when reversed in the top groove of each piston keeps kerosene and unvaporized gasoline out of oil pit.

Because of this groove No-Leak-O rings give proper Oil Control and High Compression in *each individual ring.*

No-Leak-O Piston Rings are made in one piece--easy to install --quick seating-- individually tested and guaranteed for accuracy--made of finest material--guaranteed against breakage. They combine high efficiency with low cost and lasting results.

Over 200 jobbers and dealers carry No-Leak-O in all standard sizes and oversizes. If yours does not send us his name and address.

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Write for free booklet "The Piston Ring Problem and its Solution."--Also price list and special offer to the trade. Let us tell you how to "cash in" on our 1921 Saturday Evening Post Advertising. WRITE TODAY.

Important: In buying Piston Rings insist on the genuine No-Leak-O with the original "oilSEALing" groove, packed in this standard package bearing the famous ring and seal, our registered trade mark.

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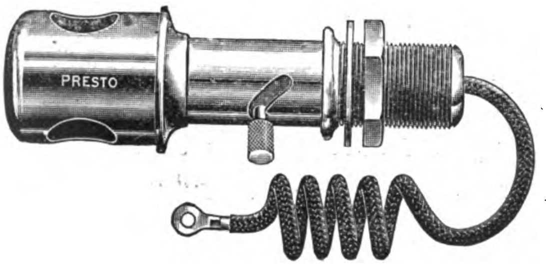
Dash Lamp for Fords

Every owner of a Ford car will be delighted to know that a really good and beautiful dash lamp has been put on the market, which can be easily and quickly applied by anyone; no mechanic or electrician is necessary, as there are no wires to be cut or spliced.

The reader will notice the extra long threaded shank with nut and washer, which permits this lamp to be applied perfectly on either an all-metal dash, or on a wood dash—metal covered, by simply boring a three-quarter-inch hole in the dash, insert



the shank of the lamp, and tighten up the nut at the back. A sufficient length of cord is furnished with clip, ready to slip over the tail light terminal connection on the back of the lighting switch on the dash, to make one side of the circuit. As the lamp is single contact in construction, the other side of the circuit is, therefore, completed through the rigid metal contact of the lamp flange with the steel dash or metal covering of the wood dash.

The lamp is equipped with individual lever switch—positive in action, durable and easy to operate—and threaded into a solid brass sleeve. The entire device is made of heavy brass throughout, beautifully nickel plated and hand polished, which will not rust or become easily scratched or marred; and is furnished complete with two candle power, 6-8 volt bulb.

The lamp is manufactured and marketed by The Metal Specialties Mfg. Co., 338-352 N. Kedzie Avenue, Chicago, Ill.

Fur Lined Overcoats

A full line of fur lined overcoats is being manufactured and sold by E. Hart, Coat Department, 518 West 134th St., New York City These coats are well made of black wool kersey cloth and lined with dark brown marmot fur. They are especially desirable for motorists who drive their cars during the winter.

Full information in regard to these coats may be obtained by writing to the maker.

Reduction of Gordon tire prices

The receivers for the Gordon Tire & Rubber Co., A. G. Ryley and A. B. Clark of Canton, Ohio, recently announced a reduction in prices which is noted in their price list No. 47.

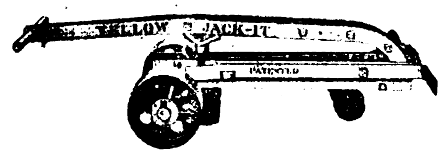
A New Dolly Jack

A new dolly jack is being introduced to the trade by Bunnell & Co., of 9 S. Clinton Street, Chicago. In general design the new jack, which is called the Yellow Jack-it, resembles other dolly jacks on the market, although it has a number of exclusive features and is of course patented.

The axle of the car is raised by means of one or more pumping motions of the handle, which operates a ratchet wheel, the latter in turn pulling a lift chain connected to the elevating rack. Distance between the cradle and the axle is first taken up by pressing the foot pedal. The grip of the handle on the ratchet wheel is controlled at will, for lifting or lowering, by means of two control rods operated by the fingers.

This jack has the advantage of a short body and of a handle which can be held at any desired angle after the car has been lifted. The jack is thus out of the way for close work, and is especially adapted for shifting position of cars in crowded quarters.

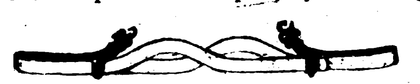
The manufacturers are having a pronounced success with the Yellow Jack-it, especially in the Chicago territory, where it has now been in use for several months.



It is made in two sizes, the smaller having a 5,000 pound capacity and the larger, for trucks, having a 15,000 pound capacity. It is also made with two styles of wheel, iron and fiber. The jacks are tested to 100% over load.

Front and Rear Lyon Convex Bumpers

An unusual and distinctive design of resilient bumper. Built of best spring steel, heat treated and oil tempered throughout. The attaching arms are integral parts of the bumper and have absolute spring action under collision impact. Guaranteed to withstand shock of bumping at 15 miles an hour without damage to car or bumper. Front bumper has an upwardly extending



broadened bumping surface affording protection to lamps and radiator. May be obtained with either three-way, or new-way fittings. Weighs only 39 pounds. Rear bumper is made with broad bumping surface extending downward instead of upward, completely shielding gasoline tank. Made with frame clamp fitting only. All bumpers individually crated. Made in black with nickel clips, and nickel with black clips.

Direct Sight Gasoline Gauge

One of the most exasperating experiences of the automobile driver may be overcome by the installation of the direct sight gasoline gauge being introduced by the Vulcan Engineering Company, of Jackson, Michigan.

The gauge works on the principle of the water level gauge and has no working parts to get out of order. There are no floats or reciprocating parts.

The gauge may be installed in 5 to 10 minutes by anyone with a wrech and screw-driver. There are no holes to bore. The gauge comes in a compact carton containing wood screws and directions for installing.

Ford Parts Bin Labels

The Haddon Bin Label Co. of 206 W. Atlantic Ave., Haddon Heights, N. J., is marketing a bin label which should be interesting to every parts dealer.

These bin labels are designed for labeling Ford parts bins and are numbered to conform with the regular Ford parts catalogue. This company also markets other types of bin labels, stock cards, repair tickets and so forth as well as garage bookkeeping systems.

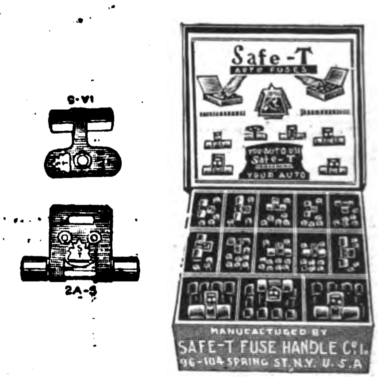
The Safe-T Fuse

The Safety-Fuse Handle Co., Inc., of 10213 95th Avenue, Richmond Hill, Long Island, New York, are marketing an automobile fuse which has a very praiseworthy feature.

The Safe-T fuse, as it is called, is made to fit partically any type of car and is made in all standard sizes. The feature of the device is its handle. Each fuse is surrounded with a fibre strip, riveted at the top into a miniature handle.

The fuse may be removed or replaced in its socket without any danger of breaking it. The fiber cover not only protects the fuse case but is strong enough so that the fuse can be handled easily.

Owners who have had experience with the old type of fuse with its slippery glass cover will appreciate this fuse which can be removed with the fingers rather than a knife or screw-driver.



Onan Lathe and Mica Undercutter

A combination unit which makes it possible to true up and turn the commutator of any starter or generator armature in the same way as with a large engine lathe is being manufactured by David W. Onan, 43 Royalston Ave., Minneapolis, Minn. Without removing the armature from the lathe it is possible, it is said, to undercut the mica between the bars in a workmanlike manner in less time than by other methods.

This lathe is built with a 7-inch swing, bed 22 inches long, and furnished with two Armstrong high speed tool bits, lathe dog, suitable wrenches, etc. It may be driven from any available power. The shipping weight, complete, is 35 lbs.

It will pay readers to investigate this new Onan product, and we should advise them to write direct to the manufacturer for full details.

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LIFE SAVING

DEPARTMENT

Be one of those wise people to profit from the mistakes of others; read this column and take a warning from the accidents which *might* have happened to you, had you been in a similar situation. Knowledge of possibilities is a good accident preventive, which, if combined with carefulness will eliminate practically all automobile mishaps.

A Narrow Escape: 'Tis not for nothing that "Providence," Rhode Island, is so called. Surely divine Providence makes a longer stay there than in most of the other places, for if she did not the following would not have ended as happily as a dime novel.

A large truck was being driven along one of the main streets of the above mentioned city. A child ran into the gutter within a hair's breadth of the auto. The driver made a desperate attempt to save the child's life by swerving the heavy truck sharply to one side. The turn was so abrupt that the truck tumbled over on its side, but the driver jumped from his seat just in time to escape, at least severe injury, and perhaps the loss of his life.

Collides with Motorcycle: An automobile driven at what was alleged to be an extraordinarily high rate of speed collided with a motorcycle in turning a corner and severely injured the man who was operating it. The driver of the automobile did not stop when the accident occurred, driving at top speed through the streets to escape the police who were pursuing him in another machine.

He was, however, overtaken some two or three miles from the place of the accident and arrested. Things were not made any lighter for him because of the merry chase he led the police. The injured man was taken to the hospital, where he is recovering from the wounds he received.

When you *have* to drill where you "can't!"

When somebody says "You can't drill in that narrow space"—get out a "Yankee" Ratchet Breast Drill No. 1555 and DO IT!

Here's why! This drill has an ingenious ratchet mechanism, one adjustment of which is the famous "Yankee" DOUBLE Ratchet. This permits continuous drilling even if you have but an inch of space in which to *move the crank back and forth* for it cuts both "going and coming." By a finger touch on the ratchet shifter (between the small central gears) you can change to Plain Drill; Left-hand Ratchet; Right-hand Ratchet; DOUBLE Ratchet (mentioned above) and in the fifth position, gears are locked for changing drill.

"Yankee" Ratchet Breast Drills do what other drills can't do, because they alone have the "Yankee" Ratchet.

Some Other "Yankee" Tools

Spiral Screw-drivers, Quick Return Spiral Screw-drivers, Ratchet Screw-drivers, Plain Screw-drivers, 1½ to 30 in. blades, Ratchet Hand Drills, Ratchet Chain Drills, Ratchet Bench Drills, Automatic Push Drills, Ratchet Tap Wrenches, Bench Vises, Removable Base.

No. 1555—(illustrated) Length 17 in. Three-jaw chuck for round shank drills up to ½ in. TWO SPEEDS. To change speed, shift little lever at hub of crank, without removing drill from work.

No. 555—Length 17½ in. Two-jaw chuck for round shank drills up to ½ in.

You should write for this helpful tool book. Mailed FREE.

Contains numerous illustrations of interest to motor mechanics. Shows how to save time and labor in working in metal and wood. Pictures work of a difficult nature being done easily, quickly and accurately. Mechanical features of "Yankee" Tools illustrated and explained.

Write today for this book

NORTH BROS. MFG. CO., Philadelphia

"YANKEE" TOOLS

Make Better Mechanics

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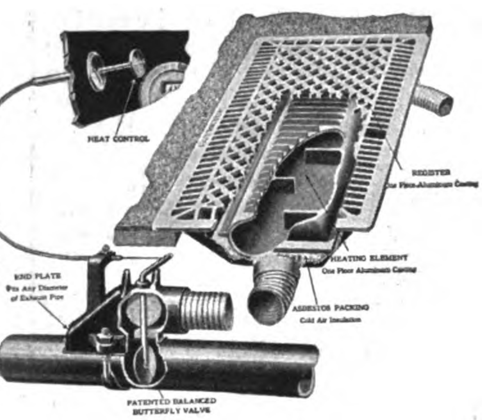
The Chanson Car Heater

The sudden coming of chill Autumn days on the heels of an especially hot summer has forcibly brought home to motorists the desirability of installing heating devices. The Channon-Hughson Company, Chicago, in announcing its "Chanson Car Heater" at this time has a message which will be gladly received.

"The Chanson Car Heater" is a car heater that is regulated exactly in the same manner as the heat in your own home and at the same time is very reasonable in price. "The Chanson Car Heater" has been pronounced a complete success in car heating by many hundreds of delighted users.

The flush type floor heater is made of one piece aluminum casting with no joints to loosen and allow exhaust gases to get



into the car. The car is therefore absolutely odorless and with baffles integral in casting, is absolutely quiet as well. There is no exhaust noise heard whatsoever.

The heater casting is so designed that it forms a solid bottom in the pan. Articles falling on the heater may be picked out as easily as off the floor of the car. The aluminum cover or floor grating is hinged to the heater pan. This is held in place by springs so designed that they prevent all rattle and noise, and at the same time, allow the cover to be swung open to get at anything that has fallen into the heater. There is also a trap door in the side of the heater pan which permits litter from the car to be removed. There are said to be no odors of dirt burning on the heater.

"The Chanson Car Heater" is furnished with five feet of control wire and five of flexible tubing so that the valve may be set at the most convenient point on the exhaust pipe. Four feet of tubing is furnished as a tail pipe to carry all exhaust fumes far to the rear of the car.

In "The Chanson Car Heater"—foot rail type—a heater is provided for those who do not care to saw through the floor boards of their car for the flush type heater. The foot rail heater has ample radiating service consisting of two pipes securely clamped to the end casting with copper asbestos gaskets and sealed with fire-proof cement preventing any possibility of odors escaping into the car. The double balanced positive valve control accomplished from the instrument board immediately regulates the amount of heat desired with the setting of the valve.

As in the case of the flush type, plenty of tubing is supplied to permit installation of the heater anywhere on the exhaust pipe and to carry away any accumulation of gases when the car is standing.

In "The Chanson Car Heater" of the flush type, the heating element is insulated from the outside cold air under the car by a heavy asbestos fire felt between the heating element and the bottom of the pan. This forces all the heat into the car

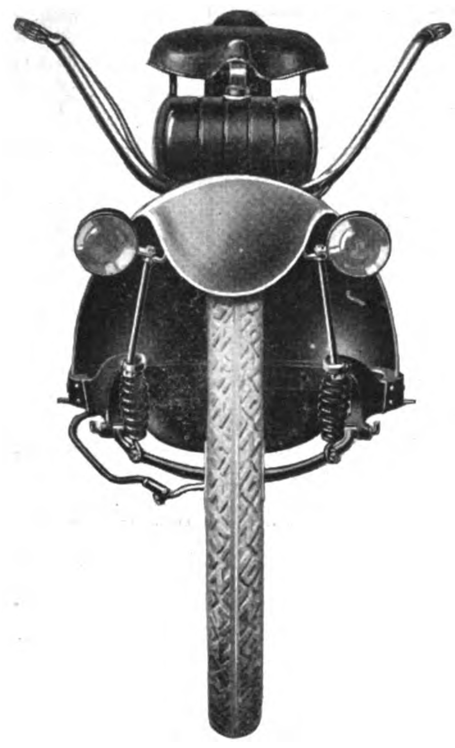
Due to the scientific arrangements and careful packing or the heating element, heat is available in less than a minute after starting the car.

The heater is manufactured by the Channon Hughson Co., 229 West Erie St. Chicago, Ill.

The Ner-A-Car

"All of the comforts of an automobile with the speed, flexibility and low maintenance of a motor cycle," is a phrase which serves to describe the "Ner-A-Car" which is being made by the Ner-A-Car Corporation of 196 South Geddes street, Syracuse, N. Y. The machine is essentially a motor cycle but it has many of the refinements of the automobile. All of the machinery, except the cylinder head, is mounted low on the frame and completely covered by a pressed steel hood. The driver is protected against the grit of the engine by this enclosure.

As will be seen in the illustration the machine is broad and comfortable. The saddle is low and the frame is open. The whole frame is suspended upon coil springs which eliminate vibration.



Our readers interested in the best in motorcycles should surely investigate this product. We might mention that the price is especially low considering the construction and other features.

Metal Stamping Company's New Sales Manager

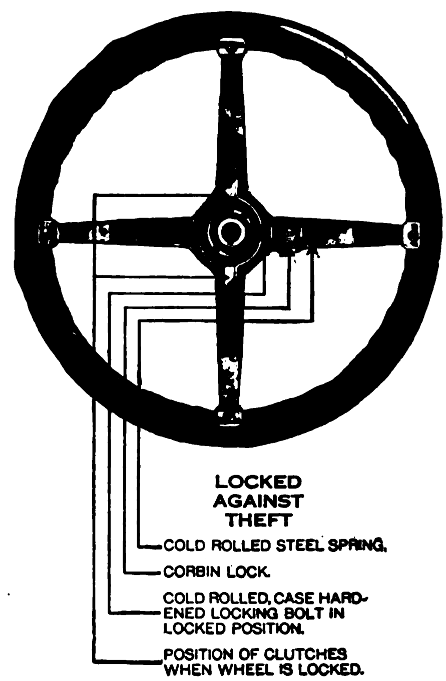
Announcement is made of the appointment of Mr. R. A. Picard as General Sales Manager of the Metal Stamping Company, Long Island City.

Mr. Picard comes to his present position from the Vice Presidency of A. J. Picard & Co., Inc., of New York City—one of the leading automobile accessory jobbers in the United States. He is the son of Mr. A. J. Picard, president of this company.

New Steering Wheel Lock

The New York Coil Company of 338 Pearl street, New York City, who for many years have been manufacturing a high grade line of ignition and automobile accessories, have just placed on the market a steering wheel lock, expressly designed for the Ford car, which is said to operate on an entirely new principle and mark a decided change in steering wheel locks.

The device consists of a stationary and movable housing, which is clamped on the



outside of the steering post by a yoke, the nuts of which are protected when the wheel is locked. When thrown in the up position as shown in the cut, two strong arms swing between two spokes, as well as *over* the spokes, so that the wheel cannot be turned in either direction, nor can the wheel be removed, a feature claimed to be entirely original.

The manufacturers lay great stress on the following features: No interference or changing any of the original steering apparatus such as disconnecting the wheel from the steering mechanism, and the elimination of any plungers to jam or prevent the wheel being turned. This feature prevents the possibility of accidents.

No key is employed to lock the device, which makes the securing of the car, with the wheels in the straight ahead or the right or left hand position, the work of an instant.

It is constructed entirely of malleable steel, which cannot be broken with the heaviest hammer.

No drilling, tapping or machine work is necessary to install, which operation is accomplished, it is stated, in two minutes with a simple screw-driver, by any one.

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Under this head will be printed advertisements of Second Hand Cars Wanted or for Sale, Accessories of any kind Wanted or for Sale, Shops for Sale or Rent, Situations or Help Wanted, Second Hand Tools or Machines for Sale or to Exchange at the uniform price of seven cents a word, including the name and address, for each insertion, payable in advance.

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Steel Gear Rings

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Send us your Old Fly Wheel and we will quickly fit it with a Steel Gear Ring—Better than Cast Iron Gears.

Our Prices Will Interest You.

CYLINDER REGRINDING

on Automatic Machinery

BROKEN PARTS WELDED or DUPLICATED

TRY US FOR SERVICE

THE ADAPT MACHINERY CO.

1624-1632 S. Wabash Ave. Chicago, Ill.

Agents Wanted

We pay $8 a day taking orders for INSYDE TYRES. Guaranteed to prevent punctures and blowouts. Double tire mileage. Any tire. Tremendous demand. Low priced. Write quick for agency. AMERICAN ACCESSORIES CO., B-211. Cincinnati, Ohio.

AGENTS WANTED: Life-time opportunity to represent manufacturer nationally known product. Big repeats, handsome profit. Sample and information free. Utility Co., 639 W. 44th St., N. Y.

Is your Ford Timer equipped with The Ahearn Timer Wire Guard? If not send $1.25 to M. Ahearn, 13 Columbia St., Ansonia, Ct., and he will send you a real Trouble Saver.

Salesmen Wanted

SALESMEN WANTED—For A. U. W. Spring Lubricating Covers for Fords. Easy seller. Terms attractive. Price six dollars for front and rear. Harrison & Hall, 2843 St. Paul St., Baltimore, Md.

For Sale

Job lot of windows for rear curtains of automobiles for nearly every make of car, replacing the unsightly isinglass. Window is finished in a beautiful nickel plated frame. Will sell job lot for 50% off list price, or can supply individual orders for any make at $7.00 per automobile. Crahan-Whalen Auto Specialty Co., 17 Federal St., Worcester, Mass.

HADCO AUTO BIN LABEL CARDS FOR AUTOMOBILE, truck and tractor parts. Metal Card Holders for wood or metal bins. Auto Job Repair Tickets, Time Sheets, Requisition Blanks, Order Books, Cash Sales Slips, Repair Tags. Send for samples and free booklets: "How to Systematize the Auto Stock Room and Build Bin Racks," "Perpetual Stock Inventories" and "Bookkeeping Hints for the Auto Dealer." HADDON BIN LABEL CO., Haddon Heights, N. J.

"Special Sale" on all kinds of tires and tubes. New and Double Tread Tires guaranteed. Write for prices stating size. I. Jaffess, 1319 Fifth Ave., Now York City.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., Good Ground, Long Island, N. Y.

Information Wanted

WANT to hear from owner having automobile or other business for sale. Give cash price and particulars. John J. Black, 223rd, St., Chippewa Falls, Wis.

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We have all of the most recent available motor vehicle registrations in every state—can promptly furnish complete states or individual counties. Send for our free booklet of statistics and prices.

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PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

PATENTS PROCURED AND TRADEMARKS REGISTERED—Eighteen years' experience. Instructions and Terms on request. Robb, Robb and Hill, Attorneys at Law, 888 McLachlen Bldg., Washington, D. C. 1340 Hanna Bldg., Cleveland, Ohio.

"Liberty" High-Pressure Tire Pump

Reece-Hilton, Inc., of Troy, New York, have developed and are now engaged in distributing throughout the automotive trade, a running-board pump of novel design and unusual power. It is said by the manufacturers that these pumps are tested to upwards of two hundred pounds pressure.

The Liberty Pump has a seamless cylinder stamped from one solid disc of steel. A self-acting valve prevents leakage. A compound leverage (produced by the peculiar construction of operating lever or handle) increases power of stroke progressively as the air pressure increases. This makes each stroke progressively easier toward the end of the stroke.

The piston head is unusually well constructed of high quality materials. A leather washer (of Graton & Knight leather) covers a wooden disc saturated with vaseline, which operates to keep the leather soft, pliable and in good working condition indefinitely. A steel band, or spring, surrounds the wooden disc inside the leather washer and exerts a steady pressure outwards, keeping the leather washer in constant close contact with the inside walls of the cylinder.

The clamps by which the pump is attached to the running-board are permanently attached to the pump, and there are no loose parts to mislay or forget.

The Liberty Pump is said by its manufacturers to expel more air at each stroke than any other hand pump, and to retain every bit of pressure between the strokes. It is absolutely guaranteed on a "satisfaction or money back" basis, and is manufactured by Reece-Hilton, Inc., Troy, N. Y. The Export Agents are the Aggressive Agencies Co., No. 1 Madison Avenue, New York City.

The Shursparc

The Sure Spark Ignition Corporation with sales office at 1731 K. Street N. W., Washington, D. C., is making a device which will be of interest to every motorist who has experienced ignition troubles.

The Shursparc, as the device is named, is said to eliminate the formation of carbon and to prevent fouling of plugs from oil leakage. It is also claimed that this device will fire any plug which is not metallically shorted.

The Shursparc is mounted in a compact insulating box which is attached to the dash or instrument board as may be convenient. This box is provided with a dial adjustment which is mounted on the instrument board in reach of the driver. When the driver wishes to clean the plugs, or should the engine develop a skipping action, he merely turns the dial and the trouble is cured.

The manufacturers claim that with Sursparc attached, less gasoline is required and the engine develops more power.

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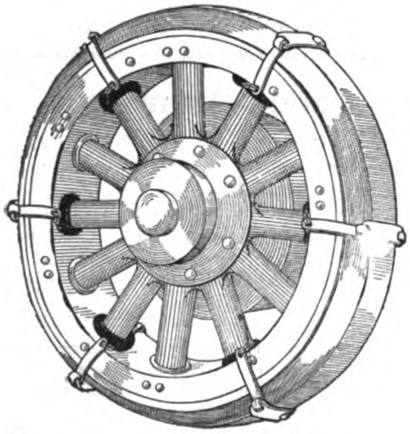
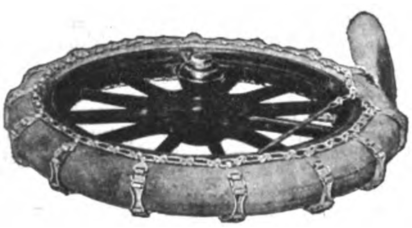
Easyon & Double-Grip Tire Chains

The Easyon and Double-Grip Tire Chains made by the Woodworth Specialties Co., Binghamton, N. Y., have some features which make them worthy of consideration. The cross members on the tread of the tire instead of being made of

twisted chain are designed especially for this purpose and have a rounded smooth surface next to the tire so as not to injure the rubber. They vary in width from one to two inches wide but are comparatively thin. On pavements or any surface where there is no tendency for the wheels to slip they lie flat on the tire and so are said to



cause no bumping. When the wheel begins to slip, however, the pull on the rear edge of the cross member tips it up so that it digs into the road and takes a very strong hold. This rocking or tilting action can take place only enough to allow it to turn up edgewise on the tire.

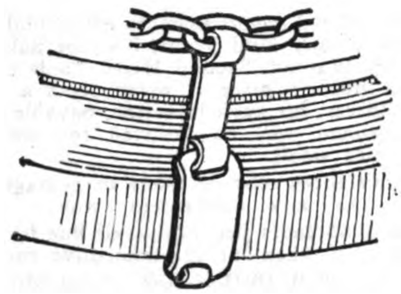


The Easyon type of chains are fastened to the spokes with leather covered fasteners. They are made for both the pneumatic and solid tires.

The Double-Grip chains have a circular side chain on each side, the ends of which are connected together with a lever fastener that enables one to draw the chain tight and so prevent rattling.

On account of the smooth surface next to the rubber there is no danger of getting the chains so tight that they will injure the tire. There are connectors on both ends of the side chains, thus eliminating any danger of the chains becoming disconnected and lost.

A very attractive circular illustrating these chains can be obtained free by addressing the Woodworth Specialties Co., Binghamton, N. Y.



A liberal discount will be quoted to dealers who write on their letter heads.

New Milwaukee Timer Display Stand

Meeting the demand of the auto supply dealer trade for display units which effectively show and sell goods the manufacturers of the Milwaukee Timer for Fords have produced a new steel display stand which is proving so popular that the original supply has had to be multiplied.

This display stand is not merely a sign picturing the goods advertised, but is said to really be an effective "silent salesman." It holds an actual Milwaukee Timer and brush assembly in such a position that the customer can see the main selling points of this fine instrument—the smooth raceway and anchored steel contact points, the patented oil-cup, the glass-hard roller and two bronze castings of the standard-type brush assembly.

The Milwaukee Timer Display stand is handsomely lithographed in three colors and is substantial enough to make a permanent counter stand or a worth-while addition to a window display of well-known, nationally advertised items. The stand is being sent without cost to dealers upon request.

Auto supply and hardware dealers are selling nearly 4000 Milwaukee Timers daily, according to recent reports from the trade.

It is manufactured by the Milwaukee Motor Products Co., Milwaukee, Wis.

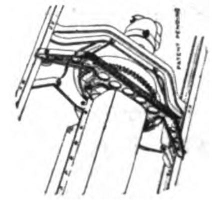
Bastian-Blessing Catalogue

The Bastian-Blessing Co., West Austin Ave. at La Salle St., Chicago, Ill., has just brought out their catalogue No. 23. From this publication it can be seen that a number of attractive items have been added to their already very complete line. Prices on a number of these items have been revised.

This catalogue, which has been brought out by this prominent manufacturer of welding and cutting apparatus, should be of unusual interest

Dunn Products Prove Popular

Among the many accessories offered to motorists, few are as popular as the Dunn Counterbalances, Dunn Support for Chevrolet 490, and Dunford Fender Braces, all made by the Dunn Manufacturing Company, Clarinda, Iowa. These articles fill a definite need, and the large sales attained



by each article shows the satisfaction they give. Jobbers and dealers report them among their most active sellers.

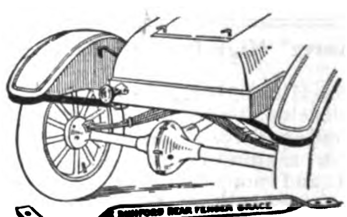
Dunn Counterbalances are said to eliminate one of the chief troubles of most motorists—vibration caused by an unbalanced crankshaft. Every garage man and dealer knows how this vibration decreases the efficiency and shortens the life of the motor Expensive cars come equipped with balanced crankshafts—their motors run smoothly and powerfully at any speed. Less expensive makes can obtain the same results by installing Dunn Counterbalances.

Anyone can install them in a few min-

utes, as a wrench is the only tool needed. They lengthen the life of the motor, increase its power and speed, give greater mileage from gasoline, and add to its efficiency generally.

The Dunn Motor Support for Chevrolet 490 is a semi-steel truss which attaches to the motor and frame directly in front of the flywheel and holds motor, clutch and transmission permanently in perfect alignment. It can easily be installed in a few minutes by anyone, a wrench is used as it is not necessary to drill any holes. It is popular with Chevrolet owners.

Dunn front and rear Fender Braces are said to overcome the breaking, cracking, twisting, rattling and other troubles com-



mon to the rear fenders on the Ford car. Their low price has made them a favorite with Ford owners. They have always proven satisfactory and enjoy a large sale.

The Dunn Manufacturing Company is making an attractive proposition to jobbers and dealers on these products. Write to them for complete information. Address Dept. C, Clarinda, Iowa.

Bear Manufacturing Co. Reduces Prices

The Bear Manufacturing Company of Rock Island, Ill., have announced a 20% reduction in the prices of Bear chains. A corrected price list showing the new prices has been prepared and may be obtained by writing to the manufacturers.

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LYON RESILIENT BUMPERS
Famous patented opened loop-end construction quickly and easily attached to any car.
METAL STAMPING COMPANY,
Long Island City, New York.

Big Profits Charging Batteries
$20 Brings an HB Battery Charger
Almost a year to pay balance on easy terms. Made in sizes for 6, 10, 16, 32 or 70 batteries. Let us recommend size to make you most money. Free trial or money back guarantee.
Hobart Brothers Co, box D117 Troy, Ohio.

$150 to $300 Monthly Profit

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CONTENTS

Weston

Electrical Instruments

Model 441
"FAULT-FINDER"

A general utility instrument. Makes every test except measuring starting current or making short-circuit test on armatures. Has separate voltmeter and ammeter—cables for plugging into instrument—clip terminals to quickly connect to circuits. Ammeter protected by replaceable fuse to prevent burnouts.

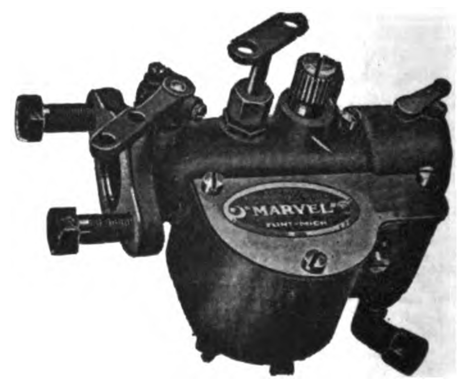
For the Dashboard or Cowl
Model 354 Ammeter

Tells instantly and accurately the exact charge or discharge rate of current flow, and promptly detects loss of current due to short circuits or grounds.

Prompt Shipments from Stock.—Write Us—Today

Weston Electrical Instrument Company
2 Weston Avenue, Newark, N. J.

FORD SPECIAL



MODEL "N" $10.00 f. o. b. Factory

Review in your mind the important part carburetion plays in your motoring experience.

Isn't it more satisfying to have a carbureter that can be depended on to function under all conditions?

Marvel performance, economy and durability is an established fact, backed by the judgment of some of the largest automobile manufacturers.

MARVEL CARBURETER CO.
FLINT, MICH.

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NEW YORK SHOW AND BUSINESS REVIVAL NUMBER

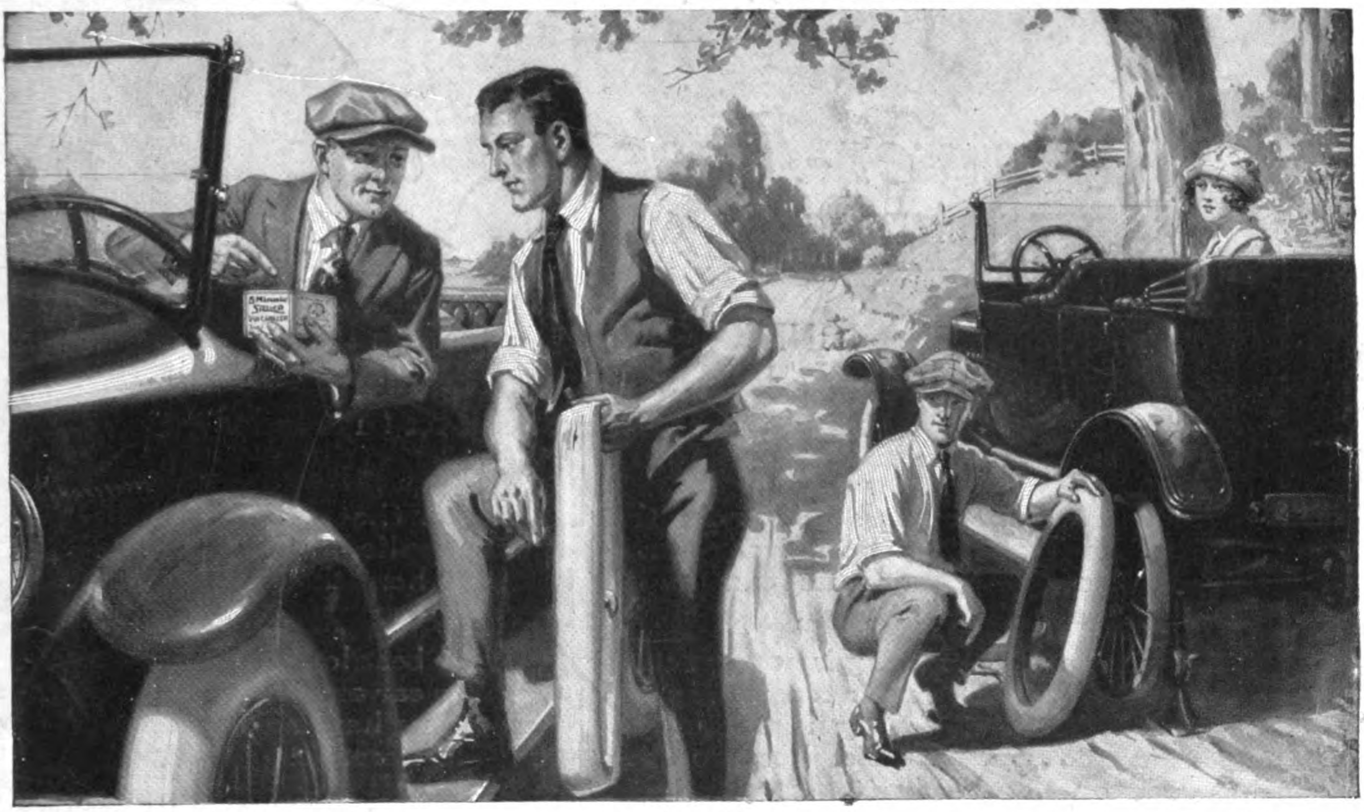
Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

THE MOTOR VEHICLE PUBLISHING CO. Cooperstown, N. Y. 71-73 Murray Street - New York City

Entered as Second Class matter January 15, 1921, at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

Vol. 32, No. 4 DECEMBER, 1921 Monthly $1.50 per Year Single Copy 15 cents



"Worth its Weight in Gold"

Over a million motorists carry the simple Shaler Vulcanizer for emergency use in making quick, permanent tube repairs—at home or on the road. It is the greatest convenience ever invented for the motorist.

Every motorist needs a Shaler — but especially Farmers who do most of their driving on country roads. It saves repair bills — is easy to use and inexpensive. The Shaler works automatically—and without fail—in wind or storm.

It's so simple that anyone can make perfect repairs.

Just touch a match to the solid chemical fuel. In five minutes the cut or puncture is repaired—a heat vulcanized, permanent repair that will not come off, better than any temporary "stuck on" patch—stronger than the tube itself. The Shaler also repairs rubbers, rubber boots, hot water bottles, rubber gloves, coats, etc.

Complete Outfit $1.50 At All Accessory Dealers

The Outfit includes—The Shaler Vulcanizer—12 Patch and Heat Units, with complete instructions. Extra Patch and Heat Units 75c a dozen. Prices slightly higher in Canada and west of the Rockies

C. A. SHALER COMPANY, 811 FOURTH ST., WAUPUN, WIS.

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The Chatter-Proof Brake Lining
AS EFFICIENT AS an AIR-BRAKE

SCANDINAVIA LINING for Ford cars has long been the lining by which all other linings are judged. It now comes packed in a new bright attractive box that is in keeping with its high quality.

Many Ford owners are under the impression that a Ford must necessarily chatter and shiver when brakes are applied. They will be glad to know that this can be eliminated when their cars are SCANDINAVIA equipped.

Scandinavia Lining is constructed of the very best long staple cotton interwoven, under tension, into a compact wear and glaze proof fabric. It is especially impregnated, processed and hardened, during manufacture, to resist heat, oil and grit. It never fails to make good on Fords.

Write for our folder, "How to Change Ford Brake and Transmission Linings," and for our attractive Dealer and Jobber proposition.

SCANDINAVIA BELTING CO.

106-108 Reade St., New York, N. Y.

Los Angeles Pittsburgh San Francisco Portland, Ore.
Easton, Pa. Boston Chicago Atlanta Cleveland

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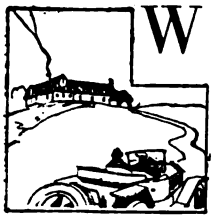
Automobile Dealer and Repairer
REGISTERED IN THE U. S. PATENT OFFICE
VOL. XXXII. No. 4 DECEMBER, 1921 PRICE {15c per copy / $1.50 per year}

Winterizing —The— Summer Car



WITH new refinements added each year to cars it becomes more practical to drive the cars throughout the winter months. Road systems are being developed, automobiles are in more general use throughout the country and within a few days after a heavy snow the main automobile roads are open to traffic.

Since the car owner drives his car during the cold weather he is interested in making the machine a more comfortable vehicle. In the days gone by the driver often froze his fingers and the passengers shivered in discomfort in the tonneau on every winter trip. But the modern car, carefully outfitted is just as comfortable as the steam heated apartment.

But the matter of winter comfort does not depend alone upon the heating of the car, there are other considerations, and it is the purpose of this article to suggest ways and means for driving in comfort not only during the colder months but for 365 days of the year.

For the purpose of simplicity I have divided my suggestions into three groups and I will consider the subjects in the order of "Safety"; "Comfort" and "Convenience."

Safety Equipment

If the car owner desires to drive his car during the winter he must be provided with a complete set of tire chains. Non-skid tires of proper design will often, possibly always, prevent skidding upon ordinary pavement moist or dry but I have found by experience that a non-skid tire running on moist snow will "ball-up" very quickly and with the snow packed into the non-skid depressions the tire is soon nothing more than a smooth, slippery surface which has little traction on smooth roads.

When chains are used, however, though the snow will pack into the links, it is quickly shaken out by the vibration of the loose links. This explains the reason why tire chains should be applied loosely instead of hugging the tire. (I speak of the cross chains rather than the retainers, the latter should be tight of course.)

You will often see cars equipped with only one or two chains. Some drivers apply a pair of chains to the rear wheels only, leaving the front wheels to skid all over the road. This is very poor practice. Other drivers apply one chain to the front, the other to the rear. This is somewhat on the same lines as the old saying of "Half a loaf is better than none." If you have only two sets of chains then put one on the front wheel, the other on the rear, and the two left wheels are the ones to carry the chains. This brings the chains to the best part of the road.

The ideal and safe arrangement is to have each wheel equipped with a chain while the car is being driven over snow. There is another argument in favor of two pairs of chains during the winter. It is possible that even the chains would not give tractive surface enough to carry the car out of a mud hole. In such an event it would be easy to fasten both sets of chains together and with a double length of chain for each back wheel one end of the chain could be fastened firmly to a spoke, around the tire and the other to a stake in the road or a board. The additional traction would then be sufficient to draw the car from the mud under its own power. An extra length or so of chain is an asset.

Some sort of a windshield cleaner is essential in the winter. Heavy rain in the summer may wash down the windshield and cloud the vision but slightly, whereas sleet or snow in the winter renders the shield anything but transparent. Driving under these conditions is virtually impossible and for safety's sake a windshield cleaner should form part of the equipment.

There are plenty of cheap cleaners on the market but for the man who likes to "tinker" I would suggest the one shown in Fig. 1 at B. The drawing is clear enough to show the construction. Note the little tail which projects downward at X. This tail is designed to connect with a piece of picture cord for moving the wiper

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across the shield. The cord is tied to the tail and carried to the right side of the shield where it is threaded through a small pulley-block. Then it is carried back to the left side of the shield, through a second block and back to the wiper again. Thus the cord is within easy

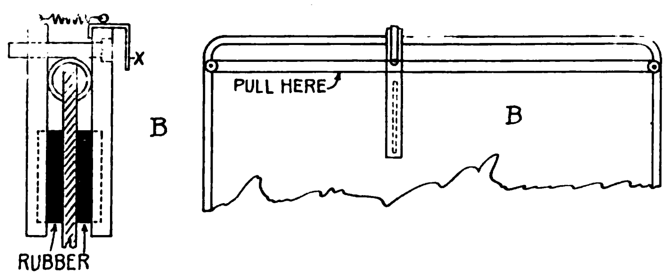

Fig. 1. Home Made Windshield Wiper.

reach of the driver who can pull the wiper either backward of forward across the wind shield.

With an open car in the summer it is easy enough to signal to the car behind by putting your arm out at the side but with the windows closed or the curtains up for winter driving it is not so convenient. Unfortunately the driver is prone to neglect this precaution because it is awkward for him to get his hand through the curtains and uncomfortable to leave a front curtain off or the window open.

If some sort of a signal is provided at the rear of the car, then the hand signal is unnecessary. In figure 2 is shown an easily constructed rear signal. An ordinary box about ten inches wide by three high and about three inches deep is constructed either from sheet metal or wood. Hinged at the left is an arm which carries either a piece of glass upon which are marked the words "Slow" and "Stop," or a piece of tin through which the words are stenciled.

The arm is connected by means of picture wire to the service brake pedal. When the brake is pushed forward just a little, the arm swings upward far enough to bring the word "Slow" into position in front of the box opening. By pressing the pedal all the way down the arm is lifted to the "Stop" position. A projecting shield at the top and another at the bottom of the box hides the arm marking which is not in use. A sliding electrical contact below the arm is so arranged that a bulb is lighted as soon as the arm moves upward to either the "Slow" or the "Stop" position.

It is our suggestion that the box be made from sheet iron, either tinned or galvanized and that a door be provided on the back so that the bulb may be changed should it be burned out. The front of the box should be covered with an ordinary sheet of window glass. The semaphore arm can be made from a sheet of tinned iron with the "Slow" and "Stop" markings cut through it in the proper places. The "Slow" may be covered with a piece of green celluloid and the "Stop" covered with red celluloid. The outside shield should be deep enough to cover the markings when the arm is in its lowest position and tall enough to hide the "Slow" stencil when the "Stop" is in use.

The electrical connection is easy enough to arrange. Connect the arm with the frame of the car (on a grounded system) and mount an insulated terminal directly back of the arm in such a way that the arm will wipe against it while the latter is in the "Slow" and "Stop" positions. The light should go out when the arm is at its lowest position.

The curtains on open cars are usually firmly hooked, when applied, to the top frames and to each other. One cannot get one's hand out to signal very conveniently. If your car is of this type, and you do not want to go to the expense or trouble of fitting it with a rear signal, then it is an easy matter to cut a square hole in the left hand front curtain and fit it with a piece of spring brass to keep it closed.

Before cutting this square hole refer to Fig. 3. It will be noted that the hole is cut on three sides only, it starts at the left hand hem of the curtain. The spring "X" is shown in the diagram and it will be noted that the end extends over the edge of the curtain slightly; this is to keep the flap in place when the arm is not pushed through it.

There is still one more device which is suggested as safety equipment for winter driving and that is some sort of an anti-glare shield, either on the wind shield or over the wind shield or both. The reason and purpose for this device are easy to see. During the winter time

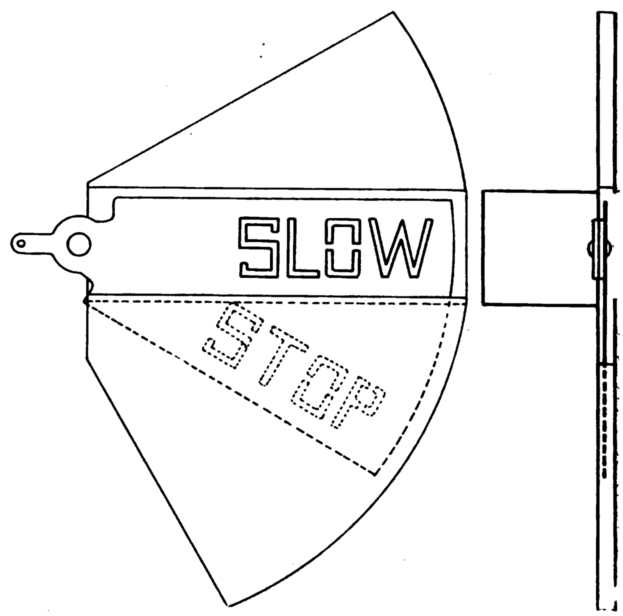

Fig. 2. Rear Signal.

the frost, or the vapor from the heat of the engine may congeal on the wind shield and though transparent will cause considerable glare, by reflection, in the eyes of the driver. This glare is increased by reflection from snow and ice and the consequent eye strain offers considerable of a hazard.

There are a number of methods of preventing this glare. Where a car is equipped with a rain visor projecting beyond the top of the wind shield it is an easy matter to cover this visor with a strip of leather or pantasote. It is also possible to obtain plate glass in any of the softer tints, blue or amber.

The second method for preventing glare is similar to that used for obscuring approaching headlights, namely, to fasten a round or square opaque shield near the top of

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the wind shield. This, however, only partially cures the trouble. Perhaps the best method is to coat the entire windshield with a thin collodion mixture in which has been dissolved a slight amount of buff coloring matter. The mixture may be applied with a camel's hair brush and will resist ordinary rains and moisture in the same way as an ordinary photographic dry plate.

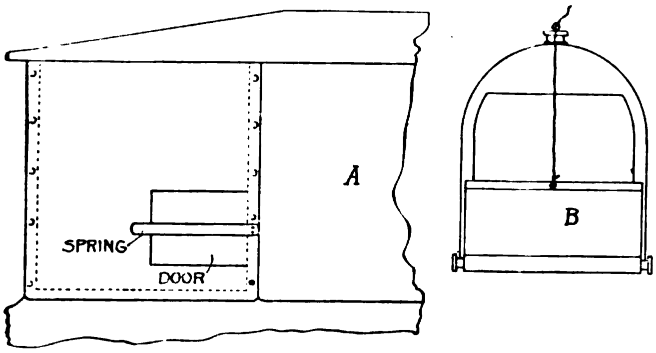

Fig. 3. Curtain Door and Radiator Cover.

When it is desired to remove the collodion, ordinary warm water or denatured alcohol will take it off very easily without scratching the glass. One application of collodion should last for the whole winter season, and even the slightest tint of yellow or blue will work wonderfully well in removing eye strain.

Equipment for Comfort

No article could be made long enough to include *all* of equipment making for winter comfort because such an article would take in nearly everything from shock absorbers to winter tops and it is not the purpose of this article to do more than to suggest possible accessories for making the car ordinarily comfortable.

Naturally the first thing to consider is a heating element for the car itself. Under ordinary conditions the engine furnishes all and more heat than need be utilized in the tonneau. The caution to observe in installing any stove arrangement connected with the exhaust manifold is to make sure that there is no chance for the leakage of exhaust gases into the car proper.

There are a number of stove arrangements marketed at present, some are ornamental and costly for better

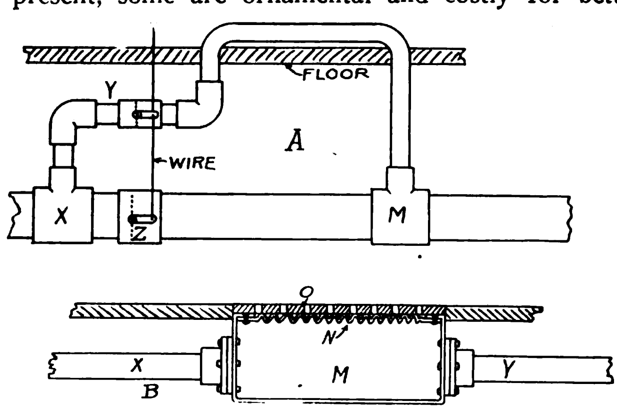

Fig. 4. Two Heaters for the Car.

cars, while others are extremely cheap, but yet serviceable. The car owner can make one of these stoves perhaps, a little cheaper than he can buy it.

The cost of the materials is not great. In Fig. 4 are shown two types of heaters, the one shown at A can be constructed from ordinary black iron pipe, painted over with heat resisting paint to match the car. In constructing this heater the exhaust pipe should be cut and a pipe cross should be inserted as shown at X, the old muffler pipe may then be inserted so as to lead straight ahead through the cross while the heater arrangement leads off at right angles.

At Y and directly beneath it at Z, in the exhaust line, are mounted two ordinary butterfly valves connected by wire and so arranged that when Y is open Z is closed and vice versa. From Y the pipe leads through the floor of the tonneau across it and back again to where it is connected again at N with the main exhaust line. By this arrangement the exhaust line is always open either through the heater or through the straight line as before and by pulling or pushing the wire the heating coils may be utilized or cut out entirely.

Unless the valve Z is arranged as shown, very little of the exhaust will go up through the heating coils to the car.

A second form of heater is shown at V. This is a flat plate arrangement and consists of a main body M fitting with a top plate N, and an ornamental cover O. The box may be made of heavy galvanized iron, bent into shape and fastened to the main exhaust line X and Y by means of lock nuts on the ends of the two pieces of pipe. It would be well to fit these joints with asbestos gaskets to prevent leakage.

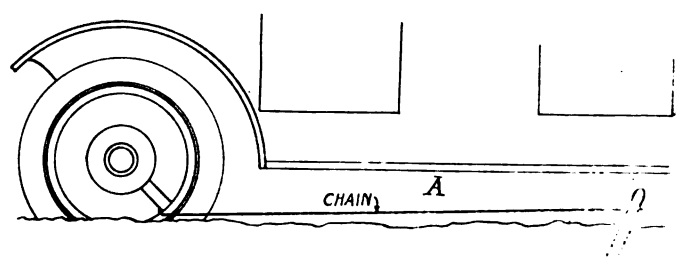

Fig. 5. Pulling Out with the Chains.

The top plate N is bolted to flanges on the main body and should be crimped as shown in the drawing. The crimp should be about one inch high and as closely together as possible in order to increase the heating surface. The ornamental plate O is simply a flat plate punched full of holes to allow the escape of heat. However, if the crimping of the lower plate has been done carefully there is no need of a top plate. The device may be as long as the width of the car or simply a short one. If it takes the whole width of the car, the exhaust will be connected with one end of the device and the muffler moved to the other side of the car and connected with the opposite side of the heater.

Naturally it is essential that the driver be as unimpeded as possible. It is not practical to have his hands encased in heavy, cumbersome gloves, and if his hands are chilled he cannot grip the wheel properly. There is a device sold at present which obviates this difficulty. The device is used for warming the hands, is attached to the steering gear and connected with the storage battery. When the

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switch is thrown on, the steering gear units automatically heat up to a certain point and furnish enough heat to keep the chill from the hands.

Not only for convenience but also for economy, the radiator should be provided with some sort of a shield, preferably of the adjustable type. B in Fig. 3 is given as a suggestion for a very convenient radiator cover. An ordinary roller is mounted beneath the lower edge of the radiator; a strip of pantasote or leather is fastened to the roller and wound around it, the other end being furnished with an eyelet.

Through the eyelet is run a piece of picture cord and the cord is carried up over the top of the radiator through an eyelet fastened on the filler cap, then through a tiny hole punched in the cowl to an eyelet on the back of the dash board. The shield may be entirely closed by pulling on the wire when the car is started and as the motor-meter shows the engine to be warm the curtain may be lowered until an even temperature can be maintained.

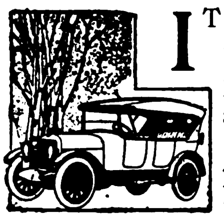
The dangers of alighting from a car in the winter when the curtains are up and there is nothing to hold on to are much greater than in the summer, and for this reason both running boards should be provided with illumination. To do this punch a hole in the rear mudguard about four inches above the running board and fit into this hole an ordinary flush tonneau light of the smallest size obtainable. The button for lighting the lights on each side may be located beneath the driver's seat.

If the proper type of light has been obtained and a double contact socket is used, one of the contacts being grounded through a wire, then the light may be removed from the back and thus will furnish light for changing tires or wheels without bothering to use a trouble lamp.

The Gas Torch in the Shop

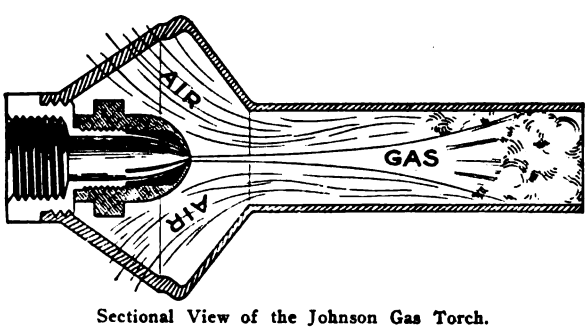
A Cheap Form of Intense Heat for Brazing and Pre-Heating Castings Before Welding

By J. F. Springer



IT may be that many have wondered why there is such a difference in the *heat* produced by certain types of burners as compared with the ordinary gas-light burner of the type that uses a lava tip. A similar comparison might have been made years ago, in the city as well as the country, in connection with the great difference in burning power between the ordinary coal-oil lamp and the central-burner lamps with cylindrical wicks. The reason for the differences suggested is fundamental in combustion. It concerns the supply of oxygen.

The burner used on an ordinary kitchen range operated by gas is really a Bunsen burner. That is, back of the flame there are openings which permit air to be sucked in by the gas stream flowing into the tip. Coming from the tip is a mixture of gas and air. This gives a more energetic flame than the ordinary lava-tip burners used for lighting. Similarly, the cylindrical-wick coal-oil lamps, with an opening from the center of the flame down through the oil container, supply the flame with oxygen on the inside of the cylindrical wick as well as on the outside.



Sectional View of the Johnson Gas Torch.

In short, combustion is fed by oxygen as well as by gas. This fundamental point should be pondered until its full significance is realized. Let me explain. City gas is composed of a number of combustibles. Take hydrogen for one. In order that the hydrogen may be burnt, sufficient oxygen must be supplied to convert it to water. The chemical formula for water is H_2O. The atomic weights of the H and the O are, respectively, 1 and 16.

All this means that for every two units of weight of hydrogen (H_2), there must be sixteen units of weight of oxygen. That is, to burn 2 ounces of hydrogen requires 16 ounces of oxygen—8 times as much. Similarly, with other combustibles in city gas. Each requires a fixed quota of oxygen. As a rule, they do not require relatively so much as hydrogen. At the same time, however, every one requires a good substantial amount so that to burn city gas to a finish requires a very considerable weight of oxygen.

Now, oxygen in the air around us amounts to only about one-fifth of the total. This complicates the matter, because we feed gas flames usually with just this kind of oxygen—that is, oxygen mixed with four times as much other matter (principally nitrogen) that refuses to burn. We feed oxygen in a very dilute form.

The combination of the two things—(1) a requirement for a great quantity of oxygen, and (2) the disadvantage of using oxygen in a very dilute form—operates to limit our success. With the ordinary gas burner having a lava tip, not enough oxygen can get quickly to the jet of gas.

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The pressure back of the gas has to be limited for this reason. Otherwise, more gas would issue than would be burnt and this would be waste of course. The Bunson gas burner and the Rochester coal-oil lamp are two successful efforts to increase the amount of oxygen supplied.

A blow-pipe run with the Bunsen burner is a fast-acting piece of apparatus. The flame is forced.

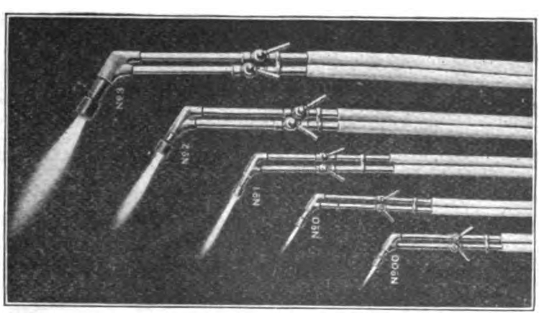
Here we have the modern devices—Bunsen burner, oxy-acetylene burner, oxy-hydrogen burner, and other inventions. Pressure is brought into the flame, and the combination goes on rapidly.

One more thing. In order to get rapid action, a very thorough mixture of air and gas must occur *before* the tip is reached. It is not sufficient that enough oxygen be on hand. It must be mixed in amongst the particles of gas. Otherwise, some of the gas will not be burnt. Every gas particle must get its proper amount of oxygen. In short, gas particles and air particles must be paired off as it were. This means mixture.

So, in the best devices, the air and the gas are made to mix before reaching the tip. It would be much better to get rid of the nitrogen beforehand, and not have it with the oxygen, diluting the latter. This is done in the oxy-hydrogen and the oxy-acetylene systems. Oxygen more or less is supplied to mingle with the hydrogen or the acetylene. The great objection is the cost of such pure oxygen. The diluted article we have all around us. It costs nothing at all.

The Johnson Torch

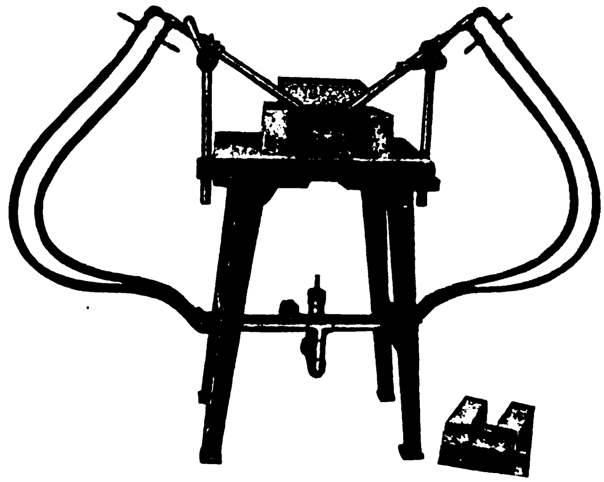
As examples, let us consider, for example, the Johnson torch, made by the Johnson Gas Appliance Company, Cedar Rapids, Iowa. The diagram is a sectional view adapted to show the mode of action. The burner consists in part of a cylindrical tube having an enlarged base. This enlarged base is a kind of double cone, the big parts next to each other. However, the cones do not have vertices, and the under one is largely cut away. The cylindrical tube with a double-conical base fits over a gas nozzle. The nozzle directs its narrow jet of gas along the axis of the cylindrical tube. The base of the gas jet—that is, the point where it emerges from the gas nozzle—is located in the plane of the largest diameter of the enlarged "double cone." The part of the "double cone" back next the gas supply tube—that is, the conical part surrounding the gas nozzle—is cut away a good deal.



Five Sizes of Gas Operated Torches.

When this burner is in action, the swiftly moving gas jet sucks air in through the openings. This air comes in all round the narrow gas jet, and mingles with it all along the cylindrical tube. As this tube is relatively of generous length, we have a considerable opportunity for mixing. In short, the cylindrical tube appears to be a good *mixing chamber.* Naturally, with the injector action here, all the onward force is supplied by the pressure back of the gas.

This is really a Bunsen burner. However, it is of modern type, especially in respect to the mode of modifying the velocity and amount of gas of the jet issuing from the gas nozzle inside the double cone. It is a complete departure from the needle-valve type, by which a needle is adjusted in the orifice. Instead, the needle is dispensed with and the tip is given a number of longitudinal slits. The tip is shaped like the bullet of a rifle cartridge and the slits run from the point back to about the base of the nose.



Torch Table Equipped with Two, Independent, Gas Operated Torches.

A cap with an orifice registering with the point of the tip is screwed over the tip. By screwing it on, the tip is squeezed together and the jet of gas made thinner. By unscrewing, the orifice is enlarged. By means of this device, the gas jet can be regulated.

The manufacturers claim 100 per cent efficiency from any gas and pressure. They claim, in fact, such perfect combustion as to get results "not heretofore obtained, both in economy and efficiency." Without any forcing of the air, the manufacturers claim that a temperature of 1800° F. may be obtained and that 2250° F. may be gotten without a blower or any forced air blast.

The Johnson burner may be obtained in a number of types. Thus, there is the simple burner mounted on an upright supported by a three-legged stand. Such a burner may be made very useful in a repair shop. It may, for example, be used with a simple metal pot lined with refractory material, if a suitable orifice is provided in the side, through which to insert the end of the burner. A milling cutter or reamer may be stood up in this pot-like furnace, and the burner may be used to heat the article.

It will be seen that a very simple furnace may thus be created. In fact, a still simpler thing may be done. There need be no metal pot with refractory lining. The

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workman may set up on his bench a temporary furnace, making it out of loose brick. This may be arranged so as to protect the work inside from all drafts and the like. Even a cover may be provided. This may be brick or even a sheet of steel plate.

However, the Johnson people make up furnaces adapted to be used with their style of torch. Thus, they have an auto-blast furnace standing on three legs. Altogether it is 28 inches high and the chamber is 16 inches deep and 12 inches in diameter. The cover may be adjusted up or down so as to enlarge or restrict the heating chamber. Half a dozen torches may be used simultaneously. A temperature of 1600° F. is claimed. This type of apparatus is suited to hardening case-hardening, annealing, and the melting of the softer metals. The gas consumption is put at 75 cubic feet per hour.

Another device consists of a three-legged stand with upright, which provides means for holding a cast iron top and the burner. The top is suited as a support for things that are to be heated. The burner is arranged to project its flame vertically through the center of the top. Such a combination is adapted for melting soft metals, for soldering, hardening, and the like. There is a pilot light provided. The burner may be adjusted up or down; or it may be entirely detached and used as a hand torch.

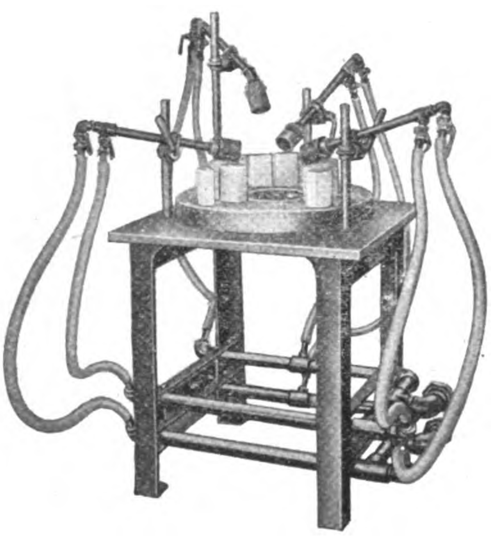

Table Equipped with Four, Gas Operated Torches.

Or, the top may be taken off and set up at the side, and the burner adjusted at an angle to command the space over the cast iron top. This whole affair is compact, simple, and useful in a repair shop.

The burners may be used singly or may be mounted in gangs. In fact, one may purchase a simple spider-like holder to which three burners may be secured, all in a vertical position. By this means a very powerful high-temperature heat may be produced.

An ingenious application relates to the use of one or more burners to heat an oven. The combustion may be accomplished inside the oven. The products of combustion may be kept outside also or be permitted to enter. The general plan makes use of tubing. This is run across the heat chamber or back and forth. The burner is partially inserted at an open end, the flame being entirely inside the tube. The idea is to convert the pipe into a flue, the burner supplying the hot air. Naturally, if the tube is left unperforated, there should be another open end so that a draft may arise and continue. However, the tubing may be perforated inside the heat chamber of the oven. Under these conditions, the products of combustion would enter the chamber. Of course, a battery of burners may be used with a corresponding battery of tubes.

There is a still more powerful type of torch than that which depends upon the Bunsen burner alone.The Bunsen burner acts by suction, only, the fuel gas being under positive pressure. By putting the air also under pressure, a very powerful torch may be secured. The great difficulty is to get air that is under pressure. Many shops have so little need for compressed air that they have no compressor or other means of producing the compressed air needed. A blower may be used to produce pressure air is the pressure wanted is not too great. Thus, the centrifugal fan of the usual type may be used to produce what is wanted. But even this is generally more or less difficult. Centrifugal fans are expensive, as a rule, and they have to be driven.

The North American Manufacturing Company, 5902 Carnegie Avenue, Cleveland, O., have solved the difficulty for the repair shop. They supply a combination of centrifugal fan and electric motor of a size suited to operate a single torch. Indeed, this apparatus does more than simply supply a current of pressure air.

A centrifugal fan takes air in centrally, on one or both sides. It discharges it along a tangent. In the present case, side openings are left and air is sucked in through these to run the fan. At the same time, a gas supply pipe connects with the perforated piece which partially closes the fan on the side. This pipe in fact supplies gas centrally to the fan and air enters at apertures all round the gas supply. The effect is that both gas and air are sucked in and whirled round and out through the discharge. This gives undoubtedly a good mixture of the two gases—air and city gas.

The American Gas Furnace Co., Elizabeth, N. J., makes brazing tables equipped with torch. Here all kinds of miscellaneous work may be done. A table may be equipped with two or four independent torches, each of which is fed by gas and air. By using loose fire-brick, one readily constructs a temporary furnace where the work may be put. The torches then supply the means of heating work and brazing metal. Obviously, these torch tables may be used for miscellaneous small furnace work—such, for example, as heating for forging, hardening, etc.

The Illustrations in this article are reproduced by courtesy of the American Gas Furnace Co. of Elizabeth, N. J. and the Johnson Gas Appliance Co. of Cedar Rapids, Iowa.

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Shooting Trouble on the Ford

Second Part of an Article Dealing With Troubles Which Often Vex the Ford Owner

By John G. Whyte

WHAT is known as a "galloping" motor is a motor which does not run smoothly at low speed or rather when running idle with throttle closed. This may be caused by two things. The first is that the space between the vibrator points may be too wide and can be remedied by turning to the right on the thumb screw adjustment on top of the coil units. They should be spaced about the thickness of an ordinary business card.

At a higher rate of speed there is more current passing through the coils, therefore they work correctly but at low motor speeds the current sometimes is not sufficient to draw the vibrator spring down to open the circuit with the result that a high tension spark is not generated and the spark plug in a given cylinder fails to fire. Worn or pitted vibrator points should be replaced. In placing the new points into position be careful to get the point on the vibrator spring directly under the point on the adjuster bar. Otherwise the points will quickly pit and burn out.

The second and most probable trouble is the carburetor adjustment. Never adjust the carburetor on a Ford car while the motor is "racing." Adjust at low speed. Turn the needle valve (which is located at the top of the carburetor) to the right until it is fully closed. Then open it to the left until you have turned it one and one-quarter turns open. Start the motor, close the throttle and very slowly turn the needle valve to the right until you hear the motor begin to operate evenly on all four cylinders. Then open the throttle suddenly. If the motor immediately speeds up, the adjustment is correct. If the motor "spits" through the carburetor, the mixture is too lean and you will open the valve very slightly to the left, racing the motor once in a few seconds until the "spitting back" stops. Then the mixture will be correct.

Overheating Motor

If a motor overheats there are several causes. The Ford car cools by the "Thermo-siphon" method, there being no water pump. The correct operation of the Thermo-siphon system demands a full radiator at all times otherwise the water cannot circulate. Lack of water would result in whatever water happened to be in the water jackets of the motor overheating as it would not be possible for it to reach the radiator to be cooled. Keep the radiator filled to the top at all times. The fan belt must be tight at all times; not too tight as the excessive tension would break the belt but tight enough so that there will be no slipping on the fan pulleys. If a fan belt is not kept tight there is not enough air pressure forced through the fins of the radiator to cool the water which is passing through, thereby causing overheating of the motor.

Too rich a mixture in the carburetor will cause overheating. Keep the carburetor well adjusted at all times. As weather conditions somewhat affect the adjustment of the Ford carburetor it is well to check up the adjustment frequently.

Never put meal or other solid substances in a radiator to stop a leak. This blocks up the pores in the radiator preventing the water from circulating and while meal will stop a leak it will do more damage through over-heating the motor than any good. Have the radiator repaired if it leaks. Sometimes the radiator becomes blocked from rust in the water and steams at times. Mix up about one-half pound of washing soda in water and pour it into the radiator. Let it stay there about a day and then drain it out and fill with fresh water. The sediment will drain out leaving a clear radiator and give better cooling.

Flooding Carburetor

When the carburetor leaks or overflows it is usually found that a spot of dirt has lodged in the check valve where the gasoline enters the carburetor. This can be often removed by draining the carburetor by means of the drain plug at the base of the float chamber. Leave the gasoline turned as the pressure coming through the pipe will tend to remove any obstruction which may be lodged in the check valve. If this does not do the trick it is necessary to take the carburetor apart for a thorough cleaning.

There is still another cause for leakage. The float in the carburetor is made of cork. It is the function of this cork float to raise the check valve when the carburetor is full and release it when the fuel begins to leave the float chamber. A piece of wood if allowed to stand for some time in liquid will absorb enough of the liquid to equal its weight and will sink. The same thing applies to the cork float in the carburetor. Lying in gasoline for a long period, it slowly absorbs a quantity of the liquid and soon looses its value as a float. It becomes heavy and sinks gradually, thereby allowing gasoline to enter the carburetor at a time when the float should cut off the supply. The result is flooding or overflowing of the carburetor.

If you will take the carburetor off of the intake manifold and remove the float chamber by means of the nut at the base which holds the float chamber in position, you will be able to remove the float. Be careful that the check valve does not fall out and get lost. Sandpaper the float lightly and place it in an oven or over an electric light bulb, allowing the float to dry thoroughly. This will evaporate the gasoline.

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When the float is dry, apply a thin coat of shellac, allow the shellac to dry thoroughly and replace the float in the carburetor. In attaching the carburetor to the intake manifold be sure that the gasket on the flange is a good one and that the two 3/8-inch cap screws which clamp the carburetor to the manifold are very tight. Otherwise air will be sucked into the manifold destroying the mixture and adjustment of the carburetor.

When the Motor Backfires

If your motor runs a few moments, then backfires and stops but you are able to start it again with the same result, the trouble is dirt in the sediment bulb located under the tank, dirty gasoline line, or water in the gasoline. Clean the sediment bulb as explained previously, disconnect the gas line from the carburetor and blow it out to clear the line, drain the gasoline out of the carburetor by means of the drain plug under the float chamber. The trouble was that a certain amount of gasoline was allowed to trickle through the sediment and would reach the carburetor. The motor would run as long as there was gasoline to run on but the suction of the pistons took the gas away more quickly than the gas line was able to supply it. A clean gasoline system is an absolute necessity and should be taken care of once every month at least.

Chattering Transmission Bands

When your car "trembles" and jars when you apply your transmission pedals, low, reverse or brake, that condition is called "chattering" of the bands. While this condition can be greatly improved by new transmission bands it cannot be entirely corrected. In the high speed clutch of the Ford there is a part which is called the "disc drum."

Considerable strain is put on this drum at times and it is subject to considerable wear which eventually causes end play. At the front of the transmission drum assembly there is a bronze bushing through which passes the transmission drive shaft. The disc drum attaches to this shaft by means of a key and a set screw. The bronze bushing is flanged and not only acts as a bearing for the transmission shaft but also as a "spacer" for the transmission drums. As this bushing and the face of the disc drum wears, considerable end play in the transmission results and it is no longer possible for the transmission bands to pull evenly on the drums. The result is a tendency to slide back and forth on the shaft and the result is chattering.

The only real cure for chattering bands is to have the motor taken out and the transmission rebushed. A large number of Ford cars chatter in the bands and it is a hard matter to prevent this condition. Chattering bands are dangerous as they loosen the rear assembly and very quickly wear out the transmission linings.

When the transmission bands fail to operate properly it is usually found that they are in need of adjustment. This is done by turning forward on the adjuster nuts at the ends of the pedal shafts under the transmission door. The door must be removed to adjust the brake and reverse bands but the low speed can be adjusted from the outside of the case. Release the jamb nut on the shaft and turn the shaft forward until the proper tension is acquired. In adjusting transmission bands, the reverse should never be as tight as the low speed and brake. Bands should be adjusted so that they do not drag. When the adjustment is taken up so that there is no more space in the shaft springs that will mean that the bands are worn out and must be replaced.

Slipping and Grabbing Clutch

On removing the transmission door you will note that at the rear of the transmission assembly there is a circular plate upon which are three adjustable fingers. If the high speed clutch slips, turn the motor until one of the fingers is at the top. Remove the cotter pin which passes through the finger and turn the adjuster screw *one half turn* to the right. Replace the cotter pin and repeat the operation on the other two fingers. If this does not give the tightness required, give another half turn to the adjusters.

In the case of a grabbing clutch, proceed as above except that you release the adjuster screws *one half turn* and repeat until the action is correct. Be careful not to drop the cotter pins into the transmission case. They will "short" the magneto field coil.

The Car Climbs When Cranking

If when cranking the Ford, the car has a tendency to move ahead even though the hand lever is at neutral position, this is caused usually by the high speed clutch being too tight. At the left side of the transmission case there is a lever with a cap screw through it which climbs a pall when the hand lever is raised. To get "more neutral" turn down on the cap screw until it is possible to crank the motor freely.

In cold weather this condition is often caused by the oil in the high speed plates hardening, causing a drag on the plates. When putting up the car for the night, drop the hand lever all the way forward. This will squeeze out all the oil in the plates and when the hand lever is raised upon taking out the car again, the plates will be free and it will be possible to easily turn over the motor. When a Ford motor turns hard in the morning and it is certain that the high speed plates are not dragging, this condition is caused by dirty and gummed oil in the motor. A thorough wash out of the motor with kerosene oil will cure this ill.

To Determine a Loose Rear

If there is noise aparently in the rear assembly of the Ford it is possible to place the trouble by means of operation of the low speed and reverse pedals while the motor is runing slowly. Press gently forward on the low speed pedal, release and apply the reverse pedal causing the car to roll back and forth slowly. If a banging in the rear is the result you will know that the rear assembly is

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becoming loose or is badly worn. Tighten the rear wheels by means of tightening the axle nuts under the rear hub caps. Try the test again and if you still have the same banging sound the trouble is in the rear. If the sound is gone, the trouble is loose rear wheels. If the axle nuts were tightened once every week there would be less rear assembly trouble.

The Ford has a semi-floating type of construction and the axle not only turns but supports the wheel. Loose nuts on a tapered axle will result in end play in the differential and undue wear will result.

When the Car Will Not Move

If the motor is running but the car fails to move when you apply the pedals, the rear assembly is at fault. It may be that the key in the pinion has broken, allowing the shaft to turn while the pinion gear stands idle. It may be a broken propeller shaft. It may be a broken axle, in which case the axle would slide out of the housing were the car towed any distance. It may be stripped differential gears inside of the rear housing. At any rate, the rear assembly must be taken down.

When doing Ford rear assembly jobs it is well to renew any or all parts which show wear. It is poor policy to just repair what actually let go. A rear built in this manner will soon give trouble again.

Ford rears should be well greased at least once every month. A considerable quantity of grease is lost at the axle ends. Lack of grease will cause trouble very quickly. A grinding sound in the rear is often caused by broken emergency brake shoes.

The only remedy is replacement and in the event that considerable trouble has been had keeping brake shoes intact in the brake drums the trouble is that the end bearing sleeve at the outer ends of the rear housing is worn allowing the axle to sag, thereby causing the wheel to run out of true with all the weight on the bottom of the brake. These brake shoes are cast iron and brake readily if not properly placed into position.

When the Front Wheels Wobble

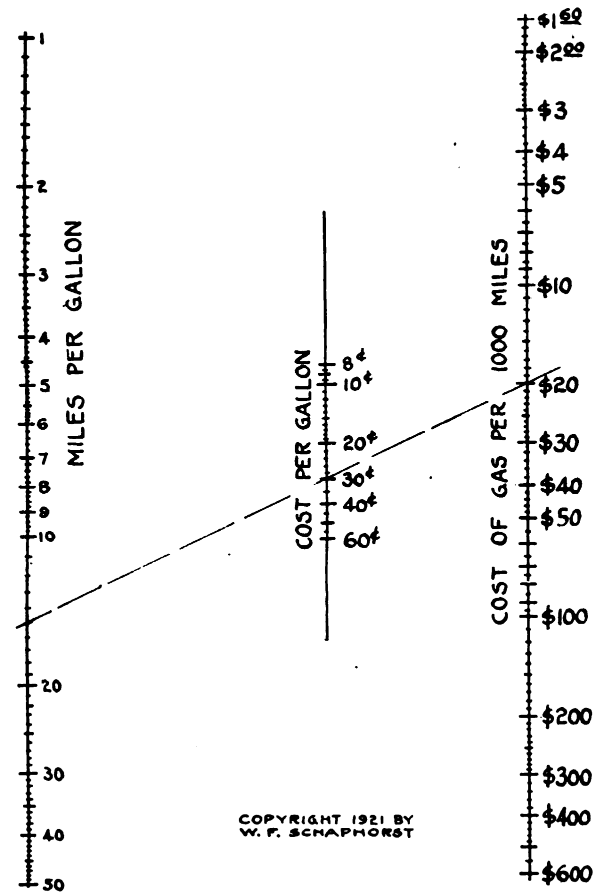
If the front wheels of the Ford "wobble" when turning and steering is found difficult, it is usually caused primarily by lack of attention with an oil can at intermediate periods. The trouble will be found in several places. The tie bolt in the front spring may be broken out allowing the spring to throw to one side causing a greater load on one wheel than on the other. The trouble may be that the "spindle body arms" which are attached to the tie rod back of the front axle, are loose.

Remove the cotter pin and tighten the nuts, replacing the cotter pin carefully. It may be that the bushings in the "spindle bodies" are worn. These bushings are of bronze and wear quickly unless well oiled. The best remedy for wobbly wheels is to thoroughly rebush the front assembly complete. This work can be done in two hours' time and the result will be excellent and safe steering. Also tighten the carriage bolts which support the steering post on the dash. Unscrew the cup from under the steering wheel and insert a quantity of heavy grease.

A HANDY ECONOMY CHART FOR AUTOMOBILE OWNERS

Copyright, 1921, by W. F. Schaphorst

THIS chart will be found useful by automobile owners in finding the cost per 1000 miles for gasoline. You don't have to do any figuring at all. Just lay a straight edge across or stretch a thread or string or rubber band from point to point and the job is done.



For example, with gasoline costing 30¢ per gallon, and a car capable of running 15 miles per gallon of gasoline at normal speed, how much will it cost to drive 1000 miles?

The dotted line drawn across the chart shows how the problem is solved. The answer is $20.00. It is so simple that I believe further explanation to be unnecessary.

The range of the chart is so wide that it will solve any ordinary problem for motorcycles, pleasure cars, or gasoline trucks.

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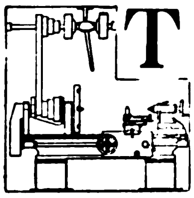
Soldering Cylinder Scores

A Cylinder Repair Method Which Requires No Great Degree of Heat or Special Skill

By David Baxter



THERE is no doubt that a scored cylinder, repaired by welding is fully restored, if the welding has been properly executed; the same kind of metal has been used to fill the score as was used in making the original casting; and if this filling is thoroughly fused with the casting metal it becomes a part of the cylinder. This is a big advantage because the filler cannot melt and run out of the score no matter how hot the engine gets. Another advantage of the welding method is that the two metals being identical there is little or no chance for chemical action to occur and cause the joint to corrode.

Fig. 1. Swab the Score with Acid.

And there is no danger of the score weld working loose to snag the piston and cause more serious trouble, if it has been correctly fused. But the welding process is comparatively expensive and requires considerable skill as to its application. And there are times when a customer will demand that his scored cylinders be soldered, both because it is cheaper and because the work can be done in a great deal less time. He knows it is more or less a makeshift job but he also knows that if the solder works loose he can have it replaced.

While there is a chance of ruining the cylinder completely if the weld is not properly executed; there is no cleaning the score out and renewing the filling as may be done with the soldered job. On top of all, the customer may know that a soldered score gives lots of satisfaction if the filling metal is conscientiously applied.

There are several metals, or solders, on the market for use especially in scored cylinders; and the method of applying them is practically the same. Any garage repair shop is already equipped for this class of work so there is no reason why they should not all take it up; either as a side line or as a specialty; for so long as carbon forms and piston pins work loose there will be scored cylinders.

Probably the chief essential of the score filling process as described herein, is that the filler metal, solder as it is commonly called, should have a melting point high enough so that it is not liable to melt out in event the cylinder is allowed to run hot. It should be hard enough so that it will not wear out easily. Then it should be thoroughly adhered to the sides and bottom of the score; that is, it should be metal which will adhere closely to the cylinder metal. There are several such metals on the market at present which meet these requirements; depending of course upon the skill and ability of the mechanic who does the work.

The Score-Filling Material

The score-filling metal used on the job illustrated in the photos accompanying this discussion, and which will be explained herein to show how to do the work, was what is known by the trade name of Kellometal. This particular brand seems to continue to give satisfaction when applied according to the method prescribed.

First, the scored cylinder to be operated on is wiped dry with clean waste or a clean dry cloth. Not merely the scored part but the entire circumference of the bore. All oil and carbon deposits are removed to prevent them from melting and running down into the scores when the melted solder is applied. It is a good idea to heat the inside of the cylinder in order to be certain all moisture or grease is removed. This is conveniently done with a welding torch flame if one is at hand. Otherwise a common tinner's torch will serve. Wipe the bore thoroughly after this heating to remove all residue.

Care should be taken not to overheat the bore, particularly if a welding flame is employed. The metal should not be red hot in any event. Then after the grease and moisture are burned and wiped out, the next important item is to scrape the entire surface of the scores. Any sort of scraper will suffice just so it clears the surface and lays the cylinder metal bright. A new file is all right although somewhat difficult to use.

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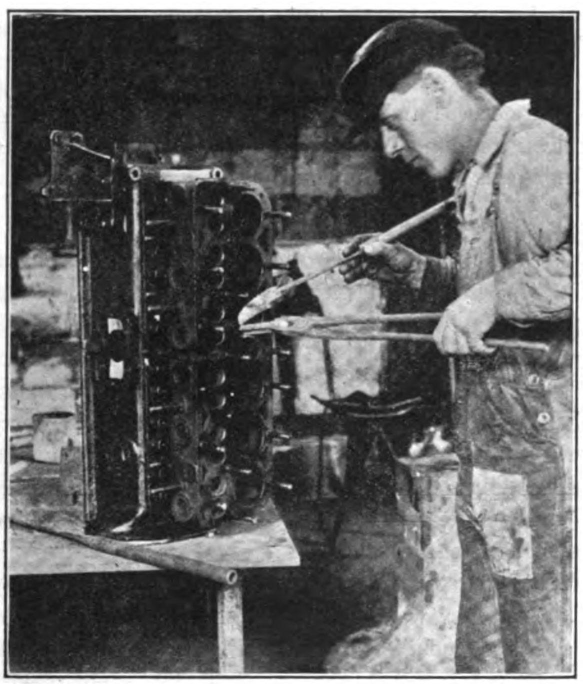
The filings or other bits of metal are then either blown out by air pressure or are brushed out with a clean dry brush. In no event should the scores be touched with bare fingers. Nor should they be wiped out with oily waste or dirty gloves. This is an essential part of the whole process.

After, or during the cleaning the cylinder block should be located upon a work bench or table where the operator can easily observe the progress of his efforts. The score should be as nearly horizontal as possible. In fact it will help to make a good job if a spirit level is used to make sure the score is not higher at one end than the other. Also the score should be located at the bottom of the cylinder bore as it stands upon the table which prevents the filler metal from running out of the score along the sides. Sometimes it is necessary to tilt the block a little sidewise to place the scored groove at the bottom of the bore.

The Acid Flux

When the block is arranged thus and it is certain not to tip or rock, the next step is to paint the groove with cut-acid which consists of muriatic acid containing zinc. It is readily made by cutting some pieces of zinc into the acid; it should be made up a few days in advance, stored in earthenware receptacles. It is poison and should therefore not be handled with the fingers, especially if they are cut or scratched.

The acid is applied to the score with any sort of makeshift swab if a wood handled brush is not at hand. A convenient swab can be made by fastening a bit of



Fige. 2. Melt a Quantity of Solder into the Score with a Curved Soldering Iron.

clean waste to the end of a stick a foot or so in length.

This swab is dipped in the pot of acid and scoured back and forth along the score until every part of the surface is saturated with the fluid. Then the swab and acid are placed out of the way where they will not cause trouble. Then the tinning of the groove is next.

This is accomplished by melting a small quantity of the filler metal, Kellometal in this case, into the score with a soldering iron. The soldering iron should of course be tinned too before attempting to tin the score. The drop of solder is briskly and firmly rubbed back and forth along the score with the point of the soldering

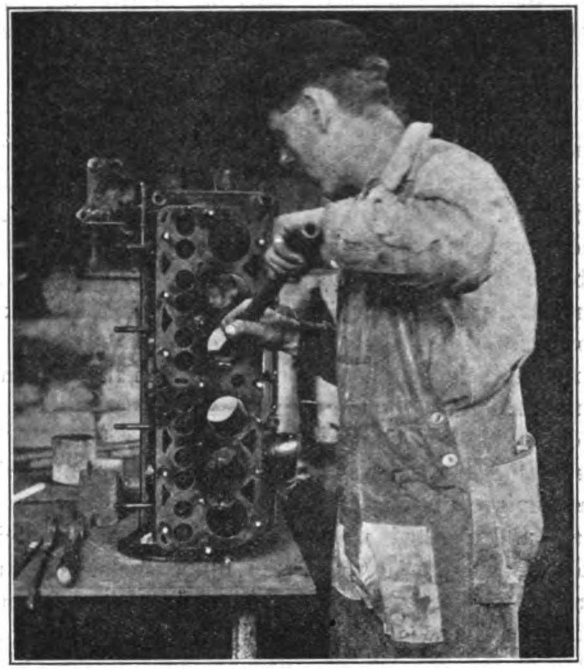


Fig. 3. Dress the Surplus Solder Down with a Curved Scraper.

iron until the whole surface of the score is coated with a thin skin of the shiny metal. This coating is very essential to the success of the score filling process; the entire surface of the score must be evenly coated with the filler metal. The soldering tool should be very hot but not red hot. If too hot the metal will oxidize and the tinning will not adhere well.

The molten solder is pushed back and forth along the score with the hot soldering tool until it adheres to the acid coated surface of the score; which is known as the tinning process.

A special soldering iron, or copper as it is often called, will be found more convenient for this class of work than the common type of soldering tool. It should be fairly heavy so it will hold the heat for a considerable time. The tip to bit should be curved upward: bent a little at the point. This is so the bottom and sides of the score may be more easily reached in applying the tinning process.

The metal for the tinning should be deposited directly from the original bar as it is not good practice to melt this metal and re-pour it in more convenient rods.

Before applying the tinning metal the soldering tool should be well tinned; it should be covered with a smooth evenly spread coat of the same metal used in tinning the score. It is not necessary to coat the whole body of the bit but the curved part and a couple of inches back from the point should be well coated.

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A convenient way to do this is to heat the iron and then dip the end of it, as much as is to be tinned, into the cut acid. This is quickly done. Then a small pool of the solder is melted upon the flat surface of a cake of pure salimoniac which should be placed level and solid in preparation for the process. Into this pool of melted metal the soldering iron is dipped to be rubbed briskly back and forth. As the metal adheres the bit is turned over several times until the part which was dipped in the acid is covered with a thin skin of the molten metal.

Reason for Tinning

The tinning is to prevent the soldering metal from balling up instead of flowing smoothly over the surface. It will easily slide from the tinned surface and adhere to the score. If the tinning does not adhere properly to the bit it should be re-heated to a higher temperature and again dipped in the acid and rubbed on the block of salimoniac.

Once the soldering tool is properly tinned the iron is again heated to apply the filling metal to the score. If a bit of oxide, which may have been caused by getting the tool too hot, prevents the tinning from adhering to the surface of the score, it will probably have to be scraped and painted with acid again before applying more tinning metal. Or if the filling metal does not adhere to the score through carelessness or on account of moisture, the whole process may have to be gone over again.

After the score and the soldering tool are properly tinned the bit is re-heated to a little below the red hot stage, ready to fill the score. To do this a quantity of Kellometal is melted from the bar and run or pushed along the groove, slightly overfilling it. The soldering tool is used to spread the molten metal and work it thoroughly into the score. Starting at the back end and gradually moving outward a little at a time, the entire score is completely filled.

The curved tip of the soldering bit is worked sidewise and lengthwise to make sure every portion of the groove is filled with adhering metal. This metal should not be patted or puddled, as it tends to oxidize when this is done. The manipulation of the bar of Kellometal and the soldering bit should be rapidly deft as there is little time to spare on account of the tendency of the bit to lose its heat rapidly. The score is filled from end to end as quickly as possible.

Cool after Filling

After filling the score the block is allowed to stand until the solder has cooled considerably. At least until certain it is set or congealed thoroughly. Then, if there are any more cylinders that are scored or if there are more than one score in the one cylinder, each one is treated the same as this one, allowing each one to set before changing the position of the block.

Where the scoring has been done by a loose piston pin there is usually a pair of scores, parallel with each other the full length of the stroke. Each of these are treated as a separate score, waiting until one congeals before attacking the other. But both may be tinned before applying the filler to either.

After filling all of the scored grooves the next step is to scrape the surplus metal down to conform with the shape and size of the cylinder bores which is conveniently accomplished with a home made scraper an old file heated bright red and hammered wide and flat at the narrow end. The file is hammered to a sharp edge so it will need less grinding. The edge is rounded by drawing it out more in the center. This rounded part should be somewhere near the shape of the curve of the cylinder bore. The sharpened end of the file is then bent downward something like a small hoe.

All of this hammering and bending should be accomplished while the file is bright red; even though it is necessary to re-heat it several times. Three inches or more of the file is heated before hammering. If hammered while cold it is liable to break.

A handle made of a piece of gas pipe about an inch in diameter two feet long is then welded to the shank of the file. This gives a better leverage and therefore makes the scraping of the soldered score easier. The blade is ground on one side to further facilitate the scraping.

A few rough cuts are scraped off first, then with increasing care the whole surface of the added metal is cut down until it conforms to the curve of the cylinder wall. If the scraper is properly sharpened it will rest on the cylinder wall on each side of the filled score as well as on the filling, when enough solder has been removed. The last layer or two is very carefully scraped in order that the surface may remain unbroken.

This surface is then polished highly, with waste and oil. Then the other scores are scraped and finished in a like manner. Particularly careful attention is paid to the sides and ends of the fillings to make certain they will not peel up when the piston is working.

(EDITOR'S NOTE: The material, Kellometal, mentioned in Mr. Baxter's article is sold by the Western Kellometal Corpn. of 721 Grant St., Denver Colorado.)

MISTAKEN IDENTITY

"Cap'n, suh," explained the unbleached motorcycle courier who had unsuccessfully attempted to navigate a French highway in night traffic, "everything was jest goin' along fine, and den Ah see mah chance to dodge in between two motorcycles."

"Well, what of it?"

"Dat's all dey was to it, Cap'n, suh. Dem two motorcycles was a truck."—*American Legion Weekly.*

NO DOUBT—"You can't sell that man an encyclopedia."

"Why not?"

"He knows it all."

"Well, he'll enjoy going over it for errors."

—*Louisville Courier Journal.*

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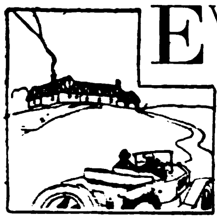
From Gas to Electricity

An Explanation of the Starting and Lighting System as Related to Fuel

By R. A. Chandler, S. A. E.



EVERY present-day automobile is equipped with a starting and lighting system as a matter of course, but this is only of recent occurrence. A few years ago self-starters were considered a luxury and we got along very well with kerosene or acetylene lights. But the luxuries of one age become the necessities of the next and so the starter, with all its auxiliary apparatus, has come to stay. Its use makes motoring much more pleasant, not to say dignified, and also makes it possible for many women to operate cars who would otherwise be deprived of such pleasure.

But installing a starter meant providing a battery large enough to supply the current required, for an ordinary starting motor draws current at the rate of 150 to 200 amperes for the short time it is used. As the battery had more than enough capacity for this work it was called upon to furnish current for the lights, doing away with kerosene and acetylene, and also for the ignition system, doing away with the magneto except in the dual system.

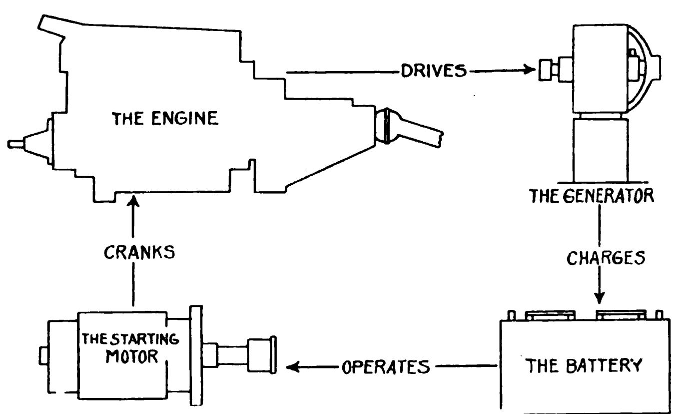
As the battery had such a heavy drain upon it the designers realized that a generator (dynamo) had to be provided to put back the current as fast as it was used or a little faster. So every car carries a source of electricity which makes more than enough current, when the car is running at normal speed, to take care of the ignition system, all the lights, the horn, and any reasonable use of the starting motor.

Starting—Running Cycle

This brings us to an interesting feature of the cycle by which this system works. The battery operates the starting motor when the switch is depressed. The motor cranks the engine until it starts. While the engine is running it drives the generator. And while the generator is working it charges the storage battery. This makes a complete cycle, for the power, under different forms, passes from the battery to the starting motor, from the motor to the engine, from the engine to the generator, and from the generator back to the battery.

To the uninitiated it would seem a simple matter to connect the generator to the battery, so that when the engine is running and driving the generator the current can flow directly to the battery and charge it. This would be satisfactory if the generator were always driven at a speed great enough to charge the battery. But when the engine slows down the voltage grows weak, and drops to nothing when the engine stops. The voltage of the battery is now high enough to overcome the slight resistance of the internal wiring of the generator and the current would flow through it, discharging the battery or burning out the generator, if some means were not provided to prevent it. This is taken care of by the cut-out, a small device that allows current to pass from the generator to the battery but prevents it from passing in the opposite direction.

If the battery were allowed to discharge through the generator it would ruin the latter by heating the wires to a point where the insulation would burn and some of the wires would fuse. The cut-out keeps the circuit open until the voltage of the generator is sufficient to overcome that of the battery. In other words the cut-out is an electrical valve, allowing current to flow in one direction and not in the other. It permits the current to pass from the generator to the battery but not from the battery back to the generator. With a three-cell battery, as ordinarily used, giving from six to seven volts, the cut-out will close the circuit (allow the current to flow) when the generator brings the pressure up to 8 or 10 volts. As this is around 12 to 15 miles per hour of the travel of the car it will be seen that the battery is being charged most of the time when the car is running.



Illustrating the Cycle of Operations in the Starting System.

But the careful operator wants to know when the current is passing into his battery or out of it, and how much, so another instrument is provided, the ammeter (short for ampere-meter). This sets on the dash where it can be inspected at a glance. The driver should know about how much current is produced at different speeds of the engine, how much the lights need, and how much should pass into the battery at night while all the lights are on. A further function of the ammeter is to show whether the battery is being charged at too high a rate, and this brings us to another piece of apparatus, the regulator.

It is extremely important to prevent too much current (too high an amperage) from passing through the battery

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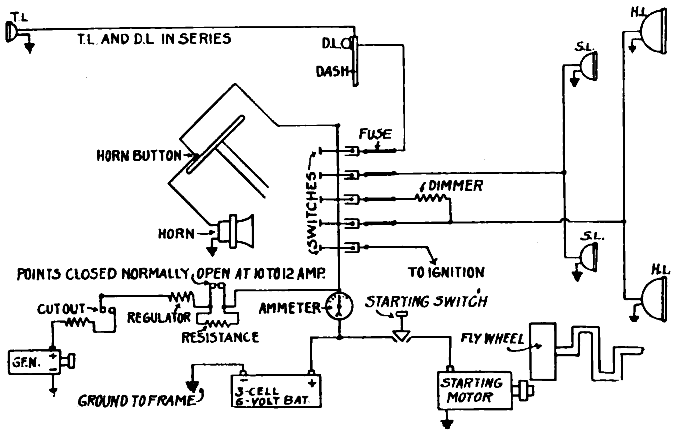
at any time. The effect is to heat the plates, causing them to buckle and spill the active material, reducing the capacity of the battery and increasing the danger of internal short-circuits. It also concentrates the acid, giving greater danger of sulphation.

Every system is protected automatically by a device called a regulator or by an arrangement of the brushes in the generator which reduces the current as the generator speeds up beyond a certain point. The regulator



A Typical Starting-Lighting and Ignition Wiring System.

consists of an electro-magnet which operates when the current becomes too strong and cuts in a resistance which reduces the current to the proper point. But this requires a separate mechanism, with moving parts, springs, platinum points, and so on, which may become corroded or give other trouble and so the tendency now is toward the arrangement of brushes in the generator mentioned above.

As the engine speeds up the armature of the generator keeps pace with it, but the brushes are so arranged that they receive less current, due to the twisting of the magnetic field. This may be observed by watching the ammeter and running the engine at different speeds with the car at a standstill. As the engine speeds up the needle will indicate up to ten or twelve amperes. But although the engine continues to increase its speed the needle will be found to indicate less and less down to ten or eight amperes. As this is entirely automatic it requires no attention from the driver beyond a glance at the ammeter occasionally to make sure it is working as it should.

The Charging System

To sum up, then, the essential parts of the charging plant are: the generator, to make the current; the battery, to receive it; the cut-out, to prevent the battery from discharging through the generator; the regulator, to prevent the battery from being charged at too high a rate; and the ammeter, to indicate the amount of current passing into or out of the battery.

The next point of interest is the starting motor, formerly called the "self-starter." That this name is incorrect will be readily seen from the fact that it does not start itself. The starter pedal must be pushed and the current from the battery runs to the starting motor and causes it to revolve, cranking the engine. Evidently the driver is the one who started it, not the starting motor.

There are at least three ways by which the starting motor may take hold of the crank-shaft or fly-wheel in order to start the engine. The one in widest use is called the "Bendix drive." Normally the starting motor is not connected to the fly-wheel, but when the pedal is pushed and current flows into the starting motor it causes the armature to turn and a pinion (small gear) on the armature shaft runs out and connects with the gear on the fly-wheel. As soon as the engine starts, the fly-wheel is turning so much faster than the armature that it pushes the pinion back out of the way, freeing itself. This is to prevent the fly-wheel from driving the armature as there is danger of damaging it. The action of engaging and disengaging is entirely automatic so that all the driver has to do is press on the pedal until the engine starts and then remove his foot.

Another way to crank the engine is to have a set of gears which are normally out of mesh. When the starter pedal is pressed these gears are forced together and at the same time the switch is closed, causing the armature to revolve and cranking the engine through the gears.

A third method is to have an over-running clutch fastened to the crank-shaft and driven by chain and sprocket from the starting motor. This is similar to a coaster brake on a bicycle. The pedals can drive the rear wheel but the wheel cannot turn the pedals. The crank-shaft can turn without moving the starter, but when the starting motor turns the over-running clutch grips the crank-shaft and cranks the engine.

The Lighting System

The lighting system may be simple or complicated, depending on the type of car. The current runs from the battery through the ammeter and then to a junction box or distributing point and from there through the various switches to the different lights. If the engine is running at usual speed the current goes from the generator to the lights and the surplus passes into the battery, the amount being indicated by the ammeter.

Besides watching the ammeter, the driver must oil the generator and starter occasionally and watch for sparking at the brushes. These may be readily inspected by removing the cover. A few fine sparks do not harm but if there is much sparking the commutator will be badly damaged. This may be due to a worn commutator, high mica, or several other causes. Have it attended to immediately by an experienced repair man. Keep a full set of lamp bulbs in duplicate and sufficient fuses. Put distilled water in the battery and test with the hydrometer once a week. Study the instruction book, ask questions, note how the system operates at different speeds of the engine, and above all—Watch the ammeter!

CLEAR TO THE TOP

Miss Gushington—Mr. Prettyman looks like a Greek god. His neck is like an ivory column.

Mr. Hardfax—Yes, and the ivory doesn't stop at the neck either.—*Life*.

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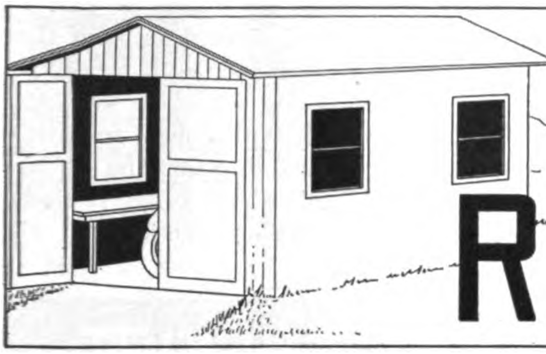


OUR OWN REPAIR SHOP

THE next machine of importance in our Experimental Department is the No. 330 Variety Saw which is made by the J. A. Fay & Egan Company of Cincinnati, Ohio. This machine should be of interest to all of our readers who are called upon to do automobile, truck or carriage body repair work.

We spoke in a previous article of the utility of such a machine in an automobile repair shop and we reiterate that such a machine can be utilized to pay just as big returns as any other machine in the repair shop. Every up-to-date repair man must realize that when he turns away automobile repair work of *any* sort he is taking a chance on loosing a good customer. If he can keep all of the work in his own shop he can give greater satisfaction than if the customer must tie up his valuable machine in three or four different places.

The variety saw which we have should be amply large enough for any sort of automobile, truck or tractor wood work. In itself, the machine might be said to be a complete carpenter shop, and during the past six months of our ownership we have yet to find a wood-working job which could not be accomplished on it. New uses of the machine come up daily. Later in this article we will take up the various uses to which our variety saw has been put.

The Saw Table

The table to this machine measures 36 x 42 inches. Is well ribbed for strength and accurately milled to surface. The table is fitted with two grooves running parallel with the saw arbor, and into these grooves fit the guides for the mitre, cross cut fences. The table is mounted upon semi-circular milled rockers which slide into milled cheeks mounted on the table yoke.

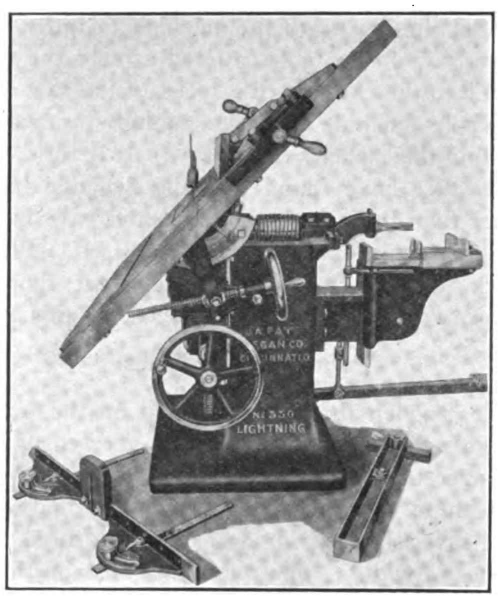
These milled rockers allow the table to swing or angle up to 45 degrees, and the micrometer index on the side shows the exact angle at which the table inclined. On our machine we have found that the action of this angle arrangement is so smooth that it can almost be spun by the momentum of the hand wheel.

The table yoke is moved upward and downward by means of a second, hand-wheel working through a low pitch screw mounted on ball bearings. Our machine is fitted with ten-inch saws (crosscut and rip) and will cut up two inches in thickness. The regular equipment includes fourteen-inch saws, instead of the ten-inch. We mention this to show that the machine has a wide range, and with a three-horse power motor the machine should easily cut up to at least four inches in thickness.

The saw arbor is mounted on the column which is a heavy one piece cord casting which also carries the table yoke. The saw arbor is mounted upon two babbitted bearings which are provided with large oil chambers. It is an easy matter to lubricate this machine when the table is tipped to about fifteen degrees, at that point both mandral bearings are accessible.

The saw end of the mandrel carries two spacing collars in addition to the two collars ordinarily used. With these collars removed, a space of over three inches is had and this space may be utilized for mounting dado or gaining heads, of which we will speak later.

The other end of the saw arbor is provided with a fitting for holding a round shank auger or ordinary drill, and as will be noted in the illustration, a sliding table nineteen inches by ten inches is located beneath this boring device. A projecting casting mounted on the main column is designed to carry a square mortise chisel.



Number 330 Lighting Variety Saw.

The device may be used of course either with the square hole cutting adjustment or simply for boring round holes for dowel pins. The movement of the table and the adjustment is such that it will cut a square hole in the stock three inches deep and as large as sixteen by eight inches in dimensions. The table has a vertical

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adjustment of eight inches and moves forward and back from the auger, a distance of five inches.

Our machine is equipped to bore three-eighths and five-eighths inch square holes and round holes to practically any reasonable size. The pressure for boring both round and square holes is obtained through a long, foot lever and only a minimum amount of effort is required for the work. The holes have square corners and are clean cut. An automatic stop arrangement is mounted upon the table so that they may be cut to any pre-determined depth up to the limit of three inches.

By moving the stock along, the machine may be used for slotting. The equipment furnished with the machine, in addition to the two saws, a cut off and a rip saw, consists of a bevel ripping fence which is adjusted to any angle from the perpendicular to about 45 degrees. Beyond this point the table may be tipped to bevel any angle between straight lines.

Fence Adjustment Bar

The plain ripping fence is faced off on each side and can be used either to the left or to the right of the saw. This fence is so arranged that it can be adjusted parallel with the cut. Both the adjustable bevel fence and the plain ripping fence slide along a milled bar at the front of the machine. This bar extends out to the right of the table so that fences can be set to the extreme edge of the table on either side. This fence bar is fitted with a graduated scale to sixteenths of an inch.

The two mitre fences are fitted with a yoke so that they may be used either singly or together. The fences are provided with an index plate and will swing to 45 degrees. The saw is entirely enclosed beneath the table with a sawdust basin which connects through a chute to a box or dust chute beneath the machine. Under ordinary conditions saw dust is not scattered around the floor but is forced into the chute by the speed of the saw itself.

The whole machine is heavy enough to take in any work within the capacity of the saw. It is rigid and well designed. We have found that the machine has many uses other than those outlined above and have mentioned that it is a whole carpenter shop in itself. Practically any work done in the ordinary carpenter shop except scroll saw work can be accomplished on this machine.

Various Possibilities

A wide wooden throat is provided on the top of the table. This throat may be removed very easily, leaving a space over three inches wide and the whole length of the dust chute. The two spacing collars may be taken from the saw arbor leaving a space about three and one-half inches in width. The retaining collar on the end of the saw arbor carries an expanding bushing which tends to center any fitting placed upon the arbor. This means that the arbor may be fitted with circular wooden wheels, which in turn may be covered with leather for buffing, with gritcloth for sanding, or with cloth discs for polishing work.

The average repairman can easily make a set of cutter heads for this machine and use it for making ordinary ornamental molding or for jointing. Thus he can cut the boards or planks for a truck, plane them, sand them and make them up into the truck body with panels and ornamental molding without going out of his own shop for anything but rough material. With a slight amount of work the machine may be adapted to planing up to three inches in width on the table and as wide as twelve inches in width on the mortising and boring device.

LIGHT BULBS BURN OUT

RECENTLY our trouble editor has been besieged by subscribers who claim that the light bulbs on their automobiles tend to burn out rapidly, and so he feels that a complete explanation of the lighting system and the generator would clarify matters somewhat. It seems a very peculiar thing, but the main cause for this trouble is due to poor connection, between the generator and, either the battery, or the current regulator.

One would naturally conclude that a poor electrical connection would result in dim lights rather than an excessive current to the light, but this is not the case. The generator is regulated in a great number of ways depending on the system in use, but in practically every case the output of the generator depends upon a balanced current through the battery. If anything happens to the battery this balance is destroyed.

The second consideration is poor connections between the generator and the current regulator. Some cars are equipped with a regulator on the dash-board which is separate from the generator. If this regulator does not function properly or if the connections to it are destroyed or poorly made, then there is a tendency for the generator to produce excessive current.

The Water System Parallel

In a majority of cases the parallel of a water tank and a water pump is a good illustration. Assume for a moment that we have a water pump which is capable of pumping a certain amount of water at practically any pressure constantly. This pump is connected through a pipe to a tank, the pipe is large enough to take care of any volume of water that the pump can furnish. The tank is located high enough to produce a water pressure of 100 lbs. per square inch, for example.

If the top of the tank is open and water continues to flow into it, the latter simply runs over the top of the tank and escapes. No matter how fast or how slowly the pump is running there is no way in which the pressure in the pipe can rise above the 100 lbs. per square inch.

If the pump runs at a lower pressure than the 100 lbs. then no water goes into the pipe, but the pressure remains constant. If the pump furnishes more pressure, then the water runs over the top of the tank.

The same is true in a generator-storage-battery system. Suppose, however, the stand-pipe becomes clogged at some point just beneath the tank. The pump keeps on running and the water having no place to escape gradually backs up and the pressure rises. If this keeps on,

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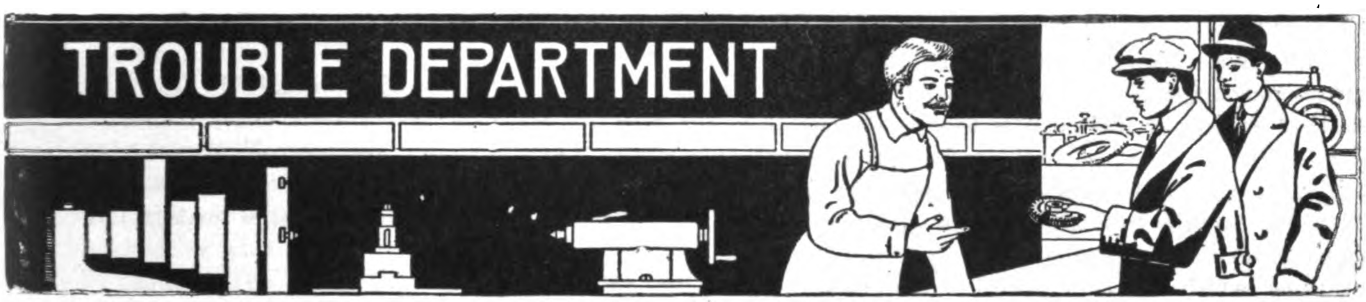
naturally something must break, either the pump bursts or the pipe is split open at its weakest point and this is so with the lighting system the automobile. If the connections between the generator and the storage battery are destroyed the generator immediately being unbalanced produces more current. If the lights are turned on, then this excessive current naturally burns out the bulbs. The current then has no escape and if the generator still continues to run it will overheat and eventually be destroyed.

Flickering lights or lights which burn brilliantly while the engine is operated at high speed are often an indication of this trouble.



Howling Timing Gears

3045

From H. J. Hayertz, North Dakota: I recently tightened the main bearings in my Ford car and since I made this adjustment the timing, gears have howled. Is there any way to overcome this trouble?

Reply: The reason why your Ford timing gears howl is because they are not properly adjusted and this fault is due to the scraping of the bearings or tightening of the bearings which has carried the crankshaft timing gear nearer to the cam shaft timing gear.

A set of new main bearings, properly installed at the Ford service station may obviate the trouble if the gears have not worn too much since the change in alignment. But this is a costly proceeding and you may even be obliged to buy a new set of timing gears.

Unfortunately there is no adjustment provided for in this car for the timing gears. Once they are out of line or meshed either too deeply or not deeply enough the grinding or howling commences.

We would advise you to have a competent mechanic look at the gears and give you his opinion. If they are properly installed they may last for years and the engine will operate satisfactorily. The howling may diminish as the gears wear into their new place, though it is also possible that they will howl until property adjusted. The mechanic can tell you about this better than we because he can see the parts and we cannot.

Leak in Float Valve

3046

From Earnest G. Ebright, Pennsylvania: Will you kindly tell me what causes the carburetor on a Marmon Car, 1918 model, to leak gasoline when the engine is stopped? The carburetor is a Stromberg.

Reply: The trouble which you are experiencing with the Stromberg carburetor is due to float valve leakage. The float, in rising upon the fuel in the bowl, should close the valve and stop the gasoline from entering.

It should be a fairly easy matter for you to remedy the trouble. Remove the float valve and coat it with some valve grinding paste, (fine grade). Twist the valve around in its seat, keeping it upright. Wipe the paste back onto the valve face and repeat until the valve fits its seat. You can test the valve out by placing it in its seat and holding it firmly with your finger. Blow through the gasoline inlet tube. If air escapes, then grind the valve more. When the valve is air tight it is fitted.

There is a second possibility, though not so probable as the above. Perhaps the float has filled with fuel. You can determine this by shaking the float near your ear. If you find that there is liquid in it, place it in boiling water and the gas will be driven out through the hole. When the float is empty seal the hole with a drop of solder.

If you still have trouble we would advise you to take the carburetor to a service station and have the level adjusted.

Trouble with Johnson Carburetor

3047

From Mortimer Frankel, New York: I have a Reo, 1916 car equipped with a 1913 model Johnson carburetor. When first starting the car the engine skips and often fires into the exhaust line. After the engine is warm it runs smoothly. We have tried a number of carburetor adjustments. If we give the engine a rich mixture it starts smoothly but after running a while it is sluggish enough to indicate too rich a mixture.

The small circular disc on the plunger over the jet is not exactly in the center, having been bent at some time or other. Do you think this may cause the trouble? If not, what is the matter?

Reply: The Johnson carburetor carries but two adjustments, one for the fuel passing through the needle valve and a second for admitting air at low speeds. The device is designed to draw air, when operating slowly, through an air valve located just below the throttle.

In adjusting this carburetor the air valve should first be closed by turning it clockwise until it seats. (We refer

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to the headless screw just below the throttle.) After the engine has been operated long enough to warm it, it should be throttled down to an idling speed and the needle valve beneath the carburetor turned clock-wise until the engine pops back into the carburetor or stops. Then open the valve until the engine runs smoothly.

A few trial adjustments will enable you to adjust this valve so that the engine will run at its minimum speed on the leanest mixture possible.

Under these conditions the mixture will be too rich, but it will be impossible to cut down the gasoline supply without stopping the engine. The idea is to find, in this way, the least amount of fuel possible to keep the engine running.

The next step is to open the low speed air valve, just below the throttle, by turning it anti-clockwise until the engine gives the best action at low speeds. The adjusting screw which keeps the throttle from closing entirely may be turned out until the engine is idling at the lowest possible speed without stopping, then turned in again about half a turn. If the engine is adjusted for extreme low speeds, while warm, it may tend to stall in traffic.

If it is found that the low speed air valve cannot be opened at all, then it is essential that the needle valve be opened to give the engine more fuel, for a certain amount of primary air is necessary for economical action.

If, on the other hand, the low speed air adjustment can be opened more than 3½ turns it is an indication that the small ring on the end of the plunger, over the spray nozzle is curved too much.

If the carburetor cannot be adjusted as above it should be taken to a service station or sent back to the factory.

The reader should realize that, with the comparatively low grades of fuel on the market at the present time, it is often difficult to obtain a smooth running engine adjustment while the engine is cold.

It is possible in your case, that the ring on the end of the plunger is causing your trouble. This ring should be located centrally over the jet.

Wiring of Cadillac 1914 Car

3048

From H. G. Gigiel, Illinois: Will you please give me the wiring diagram of the Cadillac Car, Year 1914?

Reply: The diagram is printed on this page.

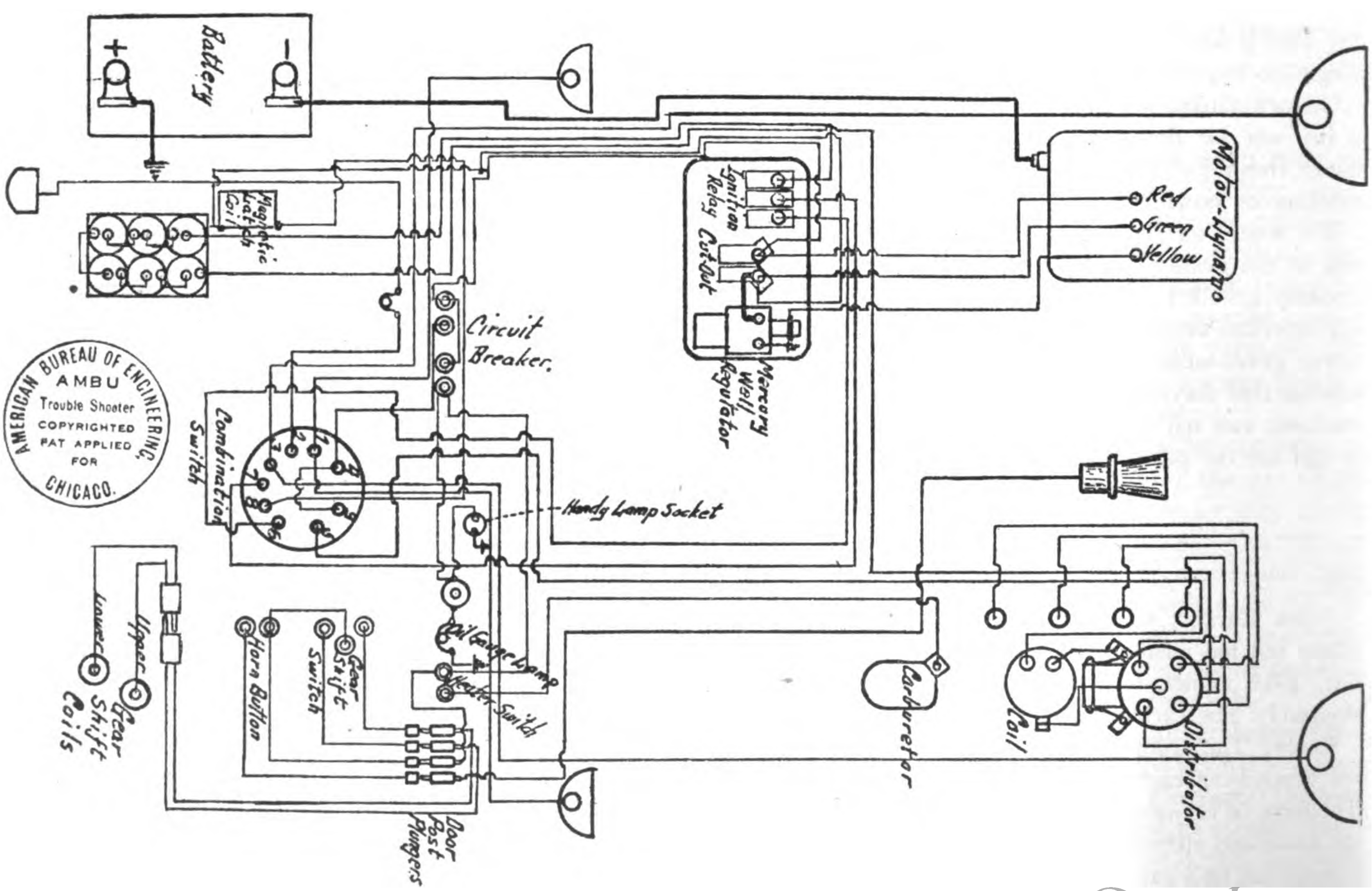
Worn Valve Guides

3049

From Wm. H. Hayes, New York: I have a Dodge car, 1915 model which operates satisfactorily except that the valve stems are loose in the block. In this engine there are no separate guides, the valve stems simply running in the block. Would you advise me to have the holes reamed and oversize stems put in? What is the effect of loose valve stems?

Reply: In order that you may judge matters for yourself we will answer the second question first. It matters but little if the engine runs satisfactorily whether or not

DELCO Cadillac 1914



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the valve stems fit the guides. We have seen a number of engines in which there was considerable valve stem play without seeming to affect the operation.

But as a general rule loose valve stems cause much trouble. In the first place there is a leakage of air around the stems which does not affect the engine at high speeds but does prevent the machine from running slowly. At slow speeds the engine is apt to skip and stall due to the surplus air drawn past the stems.

And where the valve stems are very loose the valves will not seat properly. In such event the engine skips at almost any speed. If, however, your engine can be throttled down and seems to work economically, then we doubt if the repair is justified.

If you decide that some sort of a repair is necessary, then it is optional with you as to whether oversize valves are installed, or whether you can install a set of bronze or steel guides. The costs of the two repairs are about equal. In the first case you will need to purchase a new set of valves and have them ground into place. In addition to this it will be necessary to ream the guiding holes to fit the oversize stems.

In the second case you will need to have the guiding holes reamed in the same way, but larger, and you will need to buy a set of guides. The repairman will decide whether or not the casting is heavy enough to stand this kind of repair.

If the casting will stand the extra size holes necessary for the second repair, then we would suggest that you adopt it. In the future you will need only to install new guides when the old ones wear.

Knock in Ford Engine

3050

From Forest W. Stanley, Iowa:—I have trouble with my Ford car which knocks very badly. The sound is similar to that of a loose connecting rod, but I recently tightened all of the connecting rod bearings without curing the trouble. Do you think that the trouble can be due to a loose piston?

Reply:—Side slap in the pistons would normally occur at all times if it occurred at all. That is to say, it would not matter whether the engine was pulling a load or was running idle. In many cases the slap would be more apparent with the engine running idle than when it was pulling a load.

If you have recently fitted new rings you should not be troubled with a side slap and as a matter of fact, we doubt if you would be troubled with side slap unless the car is a very old machine.

Side slap is due to small pistons or large cylinders. At each stroke the piston tips to one side or the other and raps against the cylinder wall.

If the rings were all fairly stiff and the pistons fitted fairly well, there should be no side slap.

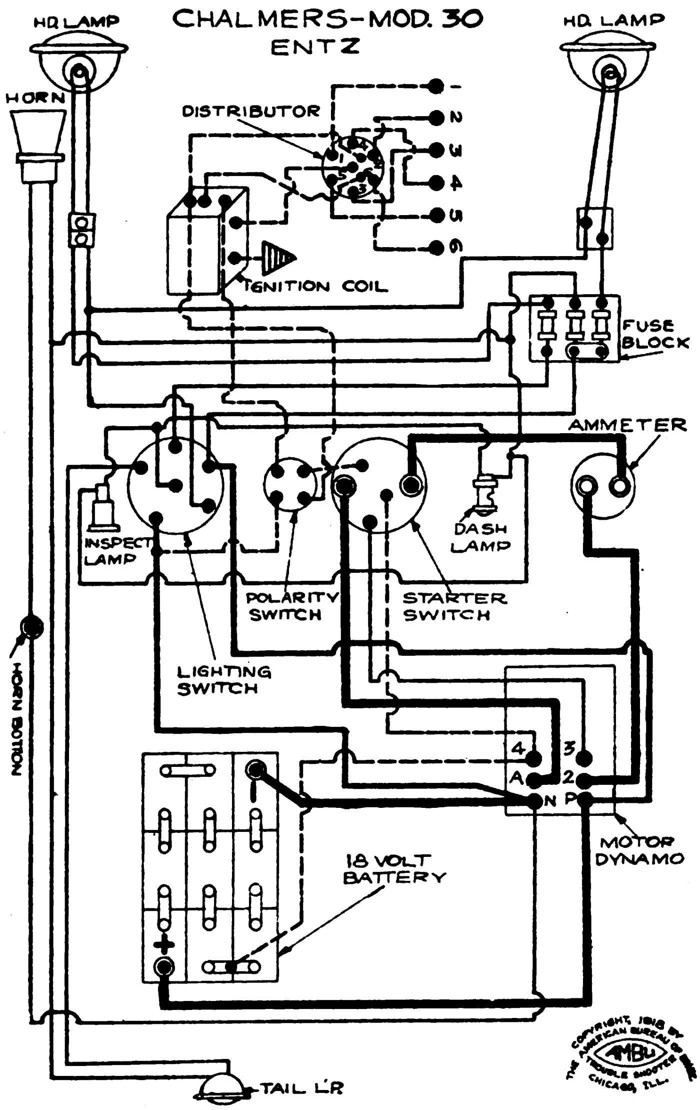
Another indication of side slap would be an extreme amount of oil working into the explosion chambers because of the extreme looseness of the pistons and the rings. If your car has all of these symptoms, you may well assume that it has side slap. We doubt, however, if this is the case, but are of the opinion that the knock is caused by an improperly lined up main bearing.

Your description of the trouble is very incomplete and leaves us nothing to base our advice upon. If you care to give us more information regarding the knock, when it occurs, how loud it is and its general character, we may be able to help you further. In the meantime, however, we should advise you to have an experienced repairman examine the main bearings.

Wiring of Chalmers Model 30.

3051

From R. W. Brighton, Kentucky: I have a Chalmers car, Model 30 equipped with an Entz starting and lighting system and an 18 volt storage battery. I



would like to obtain, if possible, the wiring diagram of this machine. Can you send it to me?

Reply: We print above the wiring diagram requested.

One Cylinder Will Not Fire

3050

From Geo. Sattler, New York: I have a 1919 Ford car

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which is giving me considerable trouble; one of the cylinders will not fire regularly. Number one cylinder will run, on a new plug, for about ten minutes then commence to skip and finally quit entirely. Upon removing the plug I find it very much oil soaked.

There is also considerable noise from the timing gears which grind continually. There is also a scraping noise in the rear of the engine or the transmission, though I have examined the brake bands and find them all right.

The engine has recently been overhauled; new pistons and plugs, a new carburetor and all of the bearings repaired. Can you give me any help on these troubles?

Reply: The trouble in number one cylinder may be due to either of two things. Either the rings are not properly fitted or the valves do not seat properly. First we would advise you to clean the spark plug in this cylinder thoroughly or to install a new one. Then start the engine and place two screw drivers between the coils of the first two valve springs respectively. Give the screw drivers a half turn to put more tension on the springs and note the result. If this cures the trouble then install a new spring on each valve.

If the trouble still persists, examine the valve and seat as well as the valve guide to see that the units are all tight and that there are no leaks. Install a heavy piece of tin around the front of the intake manifold so that it encloses both the intake and the exhaust manifolds and prevents the cold air from reaching these units.

If the plug still fouls, install an emergency spark gap upon it and if this fails to cure the trouble, have the piston rings properly fitted to prevent the oil leakage.

The timing gear trouble is answered in another letter in this issue under the heading of "Howling Timing Gears;" please refer to it.

The scraping in the rear of the engine or the transmission may be due to a great number of things and since we cannot examine it we can only hazard a number of guesses. The possible troubles are listed in the order of their possibility.

End of one of the brake bands rubbing on the drum; wire from high speed clutch rubbing on housing; broken wire dropped into housing and rubbing; foreign substance in housing rubbing on drums; one or more magnets rubbing against housing or electromagnets; oil tube rubbing against flywheel; projection on crank case rubbing against back of flywheel; gasket projecting inside of housing.

Valve Timing of Six Cyclinder Engine

3053

From E. P. Bradley, Virginia: Will you kindly advise me as to the correct position to place number one piston in relation to the cam shaft rotation in a six cylinder engine? Will you also tell me how to find the correct firing order?

Reply: The exhaust valve in the average six cylinder engine closes at 7 degrees after top center and since this varies but a very slight amount in all sixes it is the best data to use in timing a six cylinder engine.

If the flywheel is exposed its circumference can be measured and it may then be divided into six parts, each part divided into five will indicate a distance of 6 degrees between marks. If the flywheel is enclosed it will be necessary to prepare a circular chart divided into 60 parts and this chart may be slipped over the starting crank. Some sort of a fixed pointer may be fastened to the body of the car.

In timing the engine the first thing to do is to place the piston in number one cylinder at its top dead center. Then turn the chart on the starting crank so that one of the lines comes directly beneath the pointer. If the flywheel is to be marked start the mark directly beneath the pointer. Then turn the crank in its direction of rotation the distance of one division on the chart and you have moved it forward 6 degrees. It will be an easy matter to estimate one degree more and to move it forward that amount.

The next step is to place a piece of paper between the exhaust valve stem and tappet of number one cylinder, or to mark the valve stem at its lowest point so that you can tell when the valve is fully closed. Turn the cam shaft over, in its normal direction of rotation, (anticlockwise) until exhaust valve number one has fully opened and closed to release the paper or to register with the mark on the stem. At this point the timing gears should be meshed. The other cylinders will be correct because they are all timed from the same set of cams.

To find the firing order of the engine simply watch the exhaust valves. Mark them with white chalk so that you can differentiate them from the intake valves. The exhaust valves will open in the firing order. Six cylinder engines fire either in the order of 1-5-3-6-2-4 or the reverse order of 1-4-2-6-3-5, the former being the one more commonly used.

Installing an Ignition Unit

3054

From J. H. Fee, New York:—I have a Chalmers 1915 car which is equipped with a Delco distributor and coil as well as a motor-generator of the same make. I would like to take off the motor-generator and install a magneto but the ignition unit shaft runs perpendicularly. Will you give me a few suggestions as to how this may be done?

Reply:—We cannot find any blue print which will give us the exact construction of this old model but the writer seems to recall that the motor generator on this car is driven by a shaft from the timing gear case. The distributor unit is driven by a worm and gear operating on this same shaft. There is absolutely no reason why the unit, just as it stands, cannot be used to great advantage and the installation be much cheaper than were you to make a complete change of the whole thing.

If the brushes on both ends of the motor generator are removed and all the wires disconnected then the armature will operate with but little friction. Under these conditions you can use the breaker box and distributor just as it stands in conjunction with a small, cheap stor-

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age battery. The cost of re-charging the storage battery will be much less in the long run than the cost of installing a new magneto.

If, however, your friend insists upon a magneto installation, it should be an easy matter to mount the magneto on the same foot plate that the present motor generator is mounted and drive the magneto shaft from the same shaft as is used by the present motor generator, using the same couplings, etc., all the way through.

We are under the impression that the driving shaft operates at crankshaft speed, which is the correct speed for the magneto drive. If you find that the mounting comes too low on the base for the center of the magneto shaft, it will be an easy matter to block up the magneto with pieces of hard wood. In this connection we might suggest that you do not use an iron base beneath the magneto for if you do, it will prevent the magneto from generating.

We would not advise you to attempt to drive the magneto form the present motor generator through the side plates, since that would entail considerable more work than if you adopted our suggestion.

Wiring of Chevrolet 4-90; 1916

3055

From Herman Wagnalls, Wisconsin: Will you please print the wiring diagram of the Chevrolet 4-90 car; 1916 model? This machine was equipped with a two unit starting and lighting system.

Reply: The diagram is reproduced below.

Knock in Chevrolet Car

3056

From P. M. Newton, Wisconsin: I have a Chevrolet 490 car which seems to have a bad knock in the cam shaft. The faster the engine runs, the louder the knock. I have counted the engine revolutions and it seems to knock at cam shaft speed. Can you tell me the possible cause for this trouble?

Reply: If you have checked over the engine and know that the knock is in the cam shaft, then it should be an easy matter to find the trouble. In locating any knock in the engine the first step is to make a white mark on the flywheel or upon the front end of the crankshaft, or upon the pump shaft and watch it as the engine runs at low speed.

If the knock is in the cam shaft or pump shaft, then it will occur just half as rapidly as it would were it in the crank shaft.

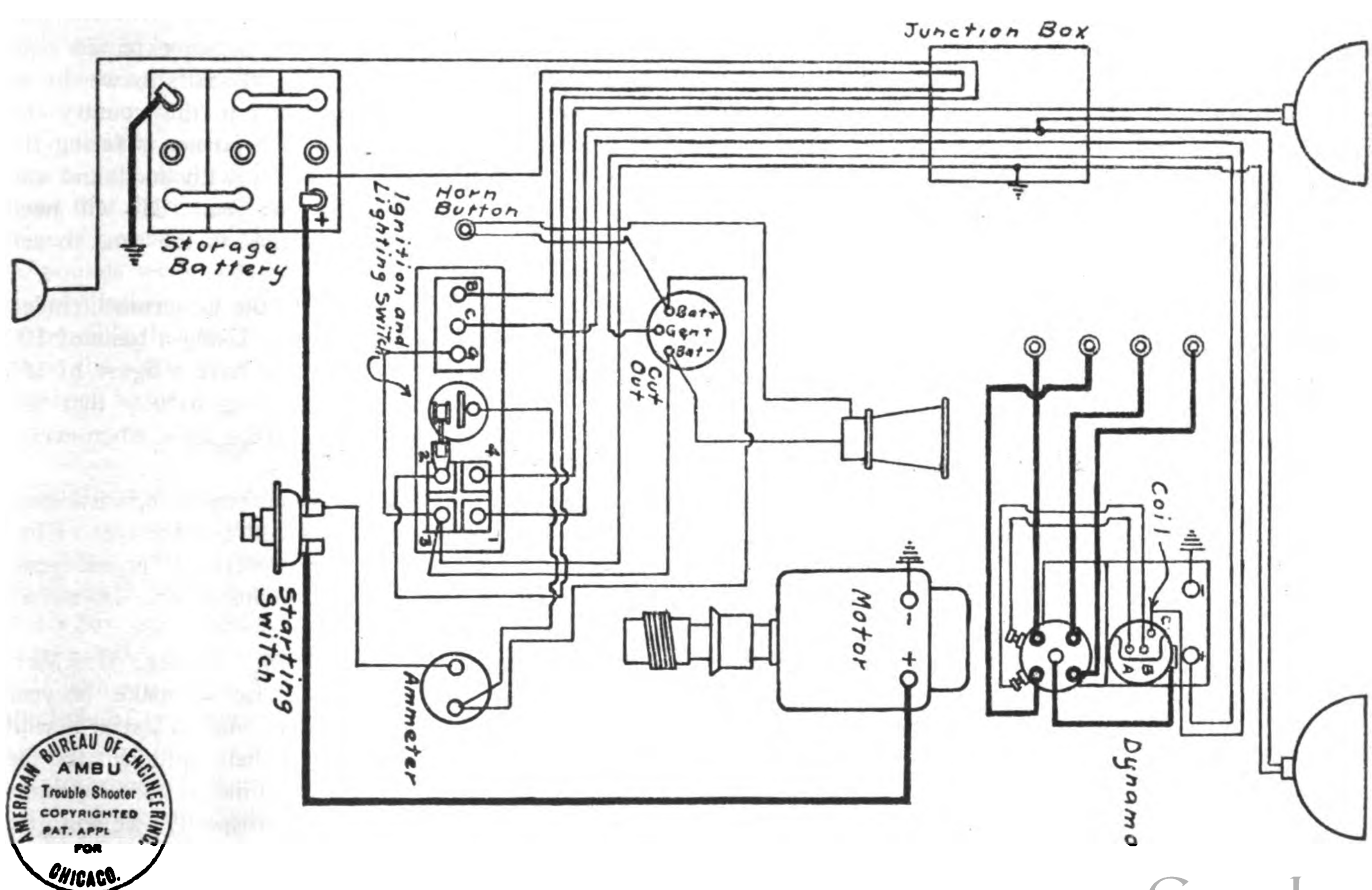
If the knock is in the cam shaft the first thing to determine is the condition of the cam shaft bearings. Remove the oil pan and grasp the cam shaft firmly. See if it can be worked up and down. If there is any side play it is an indication of loose bearings. The bearings may be loose on the shaft or in the housing and a loose bearing will usually cause a knock.

Excessive end play (1/8 inch or more) will usually cause a knock. The remedy for all of these troubles is to install new bearings where they are loose.

If no loose bearings are found, then carefully mark

(Continued on Page 60.)

AUTOLITE Chevrolet 1916 "4-90"



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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

Beginning a Big Business Boom

TALK with any big-business man today and you will find that though he deplores the past eight months and is pessimistic about the present, he has a bright and rosy outlook for the future. There seems to be something in the air which gives everyone the feeling that we are on the very edge of an era of prosperity.

This feeling is general and might be likened to the expectant hush which comes over a vast audience just before the entrance of a celebrity, the prelude to the big demonstration which is to come.

It is a psychological fact that the "Business-Boom" is born of optimism. As individuals our people may be rich, as they were on the average last December; something happens and a cloud of gloom settles down; money goes into hiding and we suffer from a business, not financial, depression. Then, without any apparent cause the gloom cloud is dispersed and in a few days everything prospers again.

We are on the verge of such a quickening. How long are we going to delay? If our manufacturers will do their part and act as leaders our big business boom will soon occur.

The masses of the people, the buying public are ready for the demonstration, they need only a few leaders, and so we appeal to the industrial leaders for their help. Radiate the spirit of optimism and the buyers' strike will be broken.

Business is picking up. We need but look at the statistics of a few of the products in our trade to see what is happening. Take the tire trade, as an instance. During October and November of last year business was normal but the big drop in rubber and the break in the demand which was furthered by the seasonal drop as well, smashed the market. Tires were a drug on the market and many manufacturers were forced to the wall.

But in July of this year the demand had increased to four times that of November 1920 and since that time the increase has been regular. People have started to buy, prices are right and the business is now on a firm footing again.

About the same conditions obtain in the accessory field though not quite so marked. It cannot be said that accessories are necessities if we consider the whole field. Of course if we were to pick out a few items such as spark plugs, mirrors, lights and so on we might find that business has been fairly normal, but we are considering the whole field and in so doing we can get a better idea of things in general.

Since accessories are not in the necessities class it follows that conditions in this line reflect general business trend. If the demand for accessories is on the increase, then general business conditions must be improving.

If we were to pick out a representative number of products in our automotive field we would find that the above statements and statistics would apply. The automotive business is improving every week and it only needs a little encouragement.

We realize that our statistics so far, while they show a growth in the automotive business, do not necessarily mean that there is to be a boom in the industry. However, a careful study of other conditions would indicate improvement.

More than half of the automobiles sold go to the farmer class. In the month of August we exported over four times as much grain and cereal stuffs as we did in any month last year. The demand in this country has increased to a marked extent. The farmer is facing the probability of supplying the world with food and can easily look for a big demand next year. He will need motorized farm equipment and now is the time to sell him.

The cost of living according to the Government index system is suggestive of prosperity. Using a basis of 100 which obtained in July of 1914 we have a figure of 165 in September, 1921. It is interesting to note that this figure is very similar to that of 1918, (159), when everything was wonderfully prosperous.

The trend of the automotive business is upward, general business conditions are likewise and the cost of living is not far above that of our previous "boom" year. The markets of the world are opening to us. Do not all of these signs point to prosperity?

Wake up Mr. Manufacturer; Mr. Dealer; Mr. Merchant! The iron is hot, strike! Let us make the year 1922 the most prosperous in history and let's start it with a resolution on January first to radiate optimism for the next twelve months. Now is the time to boom business and there is one good receipt for prosperity; we will give it to you;—

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"The only way to *do* business is to *make* business and the only way to make business is to *advertise*." In other words, "you cannot expect to sell goods if you hide them in the cellar; put them on the first floor and display them in your show window. Advertising is the show window which can be seen by every interested customer in the country."

President Harding Says—

"INDUSTRY is speeding up, prosperity knocks at our doors. Solvent financially, sound economically, unrivaled in genius, unexcelled in industry, resolute in determination, and unwavering in faith, these United Stated will carry on."

Ways of Small Repair Shops

How Other Repair Men Make the Most of Inadequate Garage Equipment

By James F. Hobart

THE slow leak is surely a mean thing to contend with, and the slower the leak the more work it is to find and cure. A little cross-roads garage which did not even possess a circular water-tank for submerging inner tubes, made use of an ordinary cast iron kitchen sink. A rubber flap-stopper about five inches in diameter was purchased at a racket store. This article had a boss and inserted ring with which to lift it, and when not in use was carefully hung upon a nail above the sink.

Into the water-filled sink, the inflated tube was pressed, a section at a time until every inch of the circumference had been examined while under water, the absence of bubbles showing that the tube was apparently tight. Failing to locate the leak, more air was pumped into the tube which, intended for a four and one-half inch tire, became nearly six inches in diameter under the vigorous inflation to which it was subjected.

Sometimes, even with all the inflation the tube will bear a very slight leak will not show itself for, bear in mind that there is a bit of difference between one or two pounds pressure in the tube while under test and 70 to 80 pounds while inflated inside of a tire! When a tube is only inflated enough to show its normal size, it may be possible that the air pressure is not sufficient to overcome the static pressure of the water in which the tire has been immersed.

Static Pressure of Water

One pound pressure per square inch will support a column of water about 26 inches high; therefore if there be only a quarter-pound pressure inside of a tube, the leak would be unable to show itself when immersed in water six and one-half inches deep. This means that with a leak on the lower side of a tube, in six and one-half inches of water, no air could show itself even were the hole of consideration magnitude. Look out that the air pressure in the tube is as great as the tube will stand comfortably and that the tube is immersed in water only barely deep enough to cover the upper side of the immersed portion.

When the leak still fails to reveal itself, pull and stretch the immersed section of tube, a bit at a time, until the leak has been found. The pulling and stretching thins the rubber section and *opens the hole* through which leakage takes place. Sometimes a thick husky inner tube will so close about a small hole that even more than a quarter of a pound of air pressure may be necessary to force apart the edges of the small hole.

Pulling and stretching the tube will reveal the slightest leak but be very careful that every part of the tube has been subjected to the stretching process. It may be possible that the one little square inch of surface in which the hole chances to be located, was not stretched so as to thin the rubber, consequently the leak was not found, even by the stretching process.

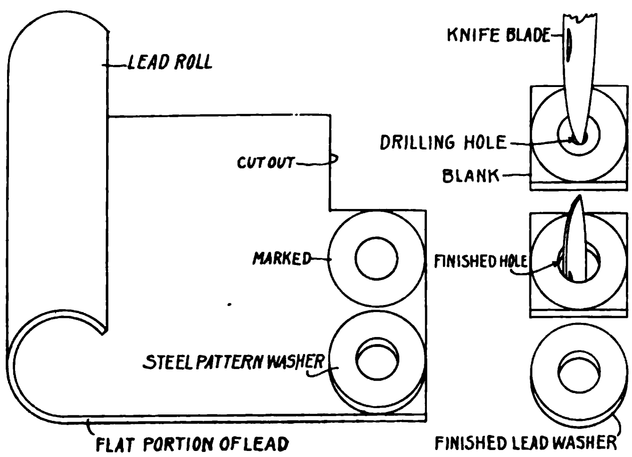

Fig. 1 How the Lead Washers Were Cut.

A fairly good way of stretching is to grasp a short section of the tube with both hands, stretch it all you can—and it requires lots of muscle to stretch a large tube—watch for bubbles along the stretched section, then with a turn of both wrists, bring the other side of the stretched section uppermost in the water. By so doing, the possible location of the leak is exposed to both deep and shallow water so there is not much danger of the leak being hidden by static water pressure or by stiffness of the rubber tube.

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Leak Around Air-Tube

In the tube tested by the garage man while the writer was watching operations, there was no need of much tube-pressure or any stretching of the tube-walls. The tube was passed around in the water almost its entire length without finding any leakage, then the air-filling tube was immersed by twisting the tube sidewise in the water—and the leak was found—it was right around the filling tube, below the nut.

The flatted sides of the filling-tube were caught in a vise, a wrench found to fit the thin nut and an attempt was made to back off the nut. But it started so very easily that the garage man stopped, and screwed the nut more than one full turn further against the tube wall. The nut had been loose. Possibly by wasting or thining of the tube but probably the nut had never been tightened properly when the filling-tube was inserted.

After the nut had been tightened, another water test was made and the tube found to be almost tight. But there was a very slight leakage left which made the garage man shake his head in disgust. He didn't waste any more time trying to stop the leak by tightening the nut on the filling-tube. He just screwed off that nut and hunted up a piece of sheet lead about one-sixteenth inch thick and unrolled a few inches and flattened it out by two smart slaps of the lead against the top of the bench.

Making a Lead Washer

A lead washer was cut out which fitted around the filling tube quite snugly. No time was wasted in "cutting and trying" but the garage man selected a steel cut washer which fitted the tube and laid the washer upon the flatted lead and scratch around, inside and out with the pointer tang of a small file.

The engraving shows how the washer pattern was

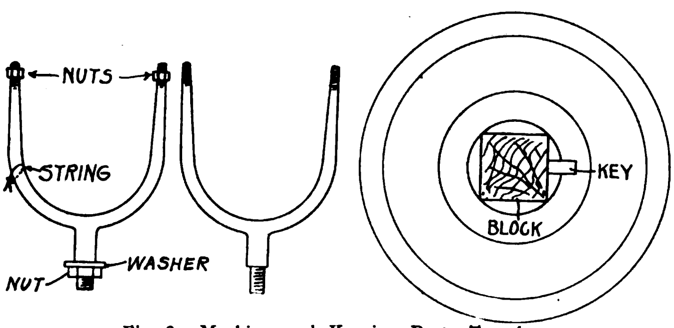

Fig. 2. Marking and Keeping Parts Together.

placed and also shows the lead washer marked out.

A blank that has been cut out of the lead with a pair of snips and a hole bored through the detached blank with the point of a small knife blade is also shown. Then, the blank was held in the fingers, the knife used from below and the hole quickly cut to the marked circle, after which the corners of the blank were removed to the outer line and the lead washer was complete.

Applying the Lead Washer

The sides of the washer were scraped with the knife-blade until the lead was free of dirt and oxide and showed bright on both sides which were rubbed lightly with dry flake graphite. The rubber around the air-tube was cleaned from dirt and iron rust and a little more flake graphite rubbed over the rubber close around the tube, but no oil was used and the garage man took care to wipe the threads of the tube quite free from any excess of oil which might run down and reach the rubber.

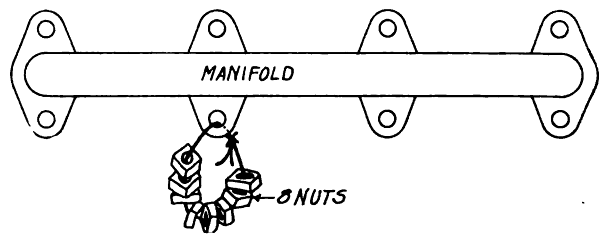

Fig. 3. Keeping the Manifold Nuts.

A very thin steel cut washer was placed on top of the lead-washer, the nut screwed down tight, and another water-test showed not a sign of a leak around the air-filling tube. The lead washer, carefully made and applied, is one of the best stop-leaks known to the writer for use when there is trouble around an air-filling tube. But the lead washer will not prove a cure unless the rubber is in fair condition.

If the tube-wall has wasted away until too thin, then lead washers will not answer and some more rubber must be placed and vulcanized fast to the tube before the lead washer will prove of use.

Do not make the mistake of using lead of considerable thickness lest the soft metal squeeze out under pressure and leak worse than ever. When the writer tried making a masher from a bit of thin lead taken from the inside of a chest which had contained Chinese tea, it was found that the lead was too thin and too hard (being partly tin) and the washer did not stop the leakage much better than if it had been made of soft copper. Indeed, a bit of thin asbestos-copper sheet gasket material will make a washer which answers about as well as the one made of soft lead

Marking Automobile Parts

The writer has been thinking about two ways of pulling down a car which he saw practiced lately in two small repair shops. One mechanic provided two boxes, one small, the other large, and into these boxes were placed the smaller parts as they were detached from the car which was to be overhauled. All nuts, washers, cap screws, grease-cups and other very small articles were thrown into the smaller box and the smaller parts of the mechanism were placed in the larger box while the largest parts were placed in a row along a portion of the garage wall.

This method was completeness itself while taking the car to pieces but when it came to putting the parts in place again, well—it was no fun, judging by the worried look on the mechanic's face and the trouble he had in finding the parts and pieces which went with each other! When a manifold was to be put back in place, the box of nuts and small bolts had to be hunted from end to end

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for the required number of nuts, and when the lamp forks were to be replaced, it was no easy task to determine which one was the left and which was the right hand fork. It could not be determined until after the forks were fastened in place and the lamps attached, and then it was some work to take out and change the forks again.

A great deal different was the method used by a mechanic who had to overhaul a Cadillac car, a make with which he was not yet well acquainted. When this man took out the lamp forks, he realized the difficulty of telling "which was which," and simply tied a bit of string around the left hand fork as shown by sketch. All through the dismantling process, when two just alike parts were found, a string tied around the left hand one told the story of which part was which.

Oil Pipes

As soon as the exhaust manifold had been detached, its clamp clips, their nuts and lock washers were threaded upon a string and tied to that manifold. The two coupling bolts were also slipped through the holes in the flanges and screwed tight *with the fingers*. This was done to prevent the nuts from working off and getting lost during any handling of the manifold. All other nuts and bolts which were replaced and left therein, were also screwed fast with the fingers to prevent any possible working out and getting lost.

When the mechanic had removed the exhaust manifold and one of the oil pipes, he saw five or six other pipes to be removed and later replaced against opening within an inch or two of each other and he began seriously to consider what would happen should one or two of those copper tunes be connected wrongly when the car was put together again.

This car had a pressure-feed gasoline system and a dash sight-feed and an oil pump, thereby giving many short and similar bits of tubing and a large number of openings to which the several tubes must be connected. The workman determined to take no chances and accordingly with some tough cardboard, a belt-punch and some stout string, he made up a lot of little tags three-quarters inch wide and two inches long.

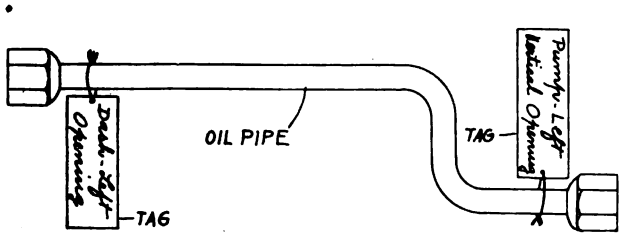

Fig. 4. How the Gas Pipe Was Marked.

As shown by the sketch one of the tags was tied to each end of the copper pipes as fast as they were removed from their places, and each tag marked with the place where that end of the tube was to be connected upon re-assembly in the car. The pipe shown in the sketch has tags bearing the following: "Dash," Left Opening, and "Pump," Left Vertical Opening. When the workman puts this bit of tube back in the car, he will have to spend no time studying whether he has the right bit of tubing, or "which end is which"! He can put the right tube in the right place right off with no loss of time.

The Gas Manifold

When the gas manifold came off, there were eight small nuts, some lock washers and two steel brackets. The latter were for holding the ignition wire manifold pipe in place and for supporting the signal horn. The two brackets were tied to the manifold with two bits of stout string and the eight nuts were threaded upon another string and also tied to one of the manifold lugs as shown

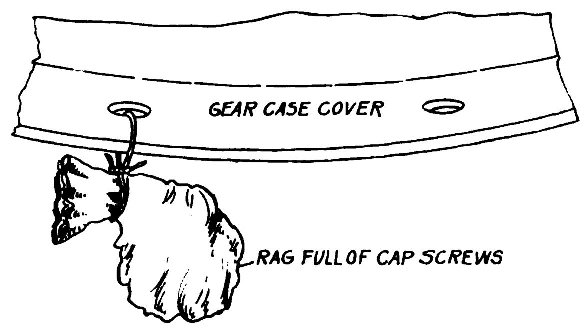

Fig. 5. Cap Screws Attached to Proper Part.

by the sketch so that when the manifold was to be replaced, all the parts and fixtures needed with it, were right there, without losing one minute in hunting for the parts and without getting hold of some wrong parts and overlooking others!

When the sheave was removed which drove the fan belt a small Woodruff key was found sticking in the end of the pump shaft. The key was removed from the shaft, placed in the sheave pulley as shown by sketch and a bit of soft wood sawed off right length to be driven into the hub as shown by the sketch. The bit of wood held the key fast, with no danger of its ever dropping out, no matter how much the sheave might be handled around before being cleaned and replaced where it belonged.

When the aluminum cover was removed from the chain case, revealing the silent chain drive of valve shaft and generator shaft, there were sixteen small cap screws of various lengths. The mechanic placed all the screws on a bit of cloth, tied it into a little bag and made it fast with the tie-string to one of the flange-holes shown by the sketch, and he never lost a screw or lost a minute picking out the right ones from a mass of screw junk.

The mechanic went ahead thus when taking down every portion of the car. It required a few minutes to care for the small loose parts belonging to each major portion of the car in this way but when everything had been stripped off and piled neatly along the side of the garage, there were very few parts in either the little or the large box.

The mechanic who was using the "tie-fast" method, told me he probably spent two or three hours in tagging and tying parts. But, he added, with a twinkle in his eye: "I'll bet a spark-plug that the other fellow has spent ten hours solid, hunting for small parts in those two boxes of his! It's a mighty good system, that tagging and tying business. Saves lots of time and trouble."

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Coming Automobile Shows

January 7-14.
New York, N. Y. Automobile Show. National Automobile Chamber of Commerce.

January 14-21.
Buffalo, New York. Automobile show. Automobile Dealers Association.

January 14-21.
Philadelphia, Pa. Automobile Show. Automobile Trade Association.

January 16-21.
Rochester, N. Y. New York Automobile Show. Automobile Dealers Association.

January 19-25.
Milwaukee, Wis. Automobile Show. Automobile Dealers Association.

January 21-26.
San Francisco, Cal. Automotive Equipment Exposition. Automobile Dealers Association.

January 21-28.
Baltimore, Md. Automobile Show. Automobile Trade Association.

January 21-28.
Cleveland, Ohio. Automobile Show. Automobile Manufacturers and Dealers Association.

January 23-28.
Toledo, Ohio. Automobile Show. Automobile Shows Co.

January 23-29.
Portland, Ore. Automobile Show. Automobile Dealers Association.

January 28-February 4.
Allentown, Pa. Automobile Show. Lehigh Automobile Trade Association.

January 28-February 4.
Chicago, Ill. National Automobile Show National Automobile Chamber of Commerce.

January 30-February 4.
Scranton, Pa. Automobile Show. Motor Trades Association.

February 4-11.
Youngstown, Ohio. Automobile Show. Automobile Dealers Association.

February 6-11.
Schenectady, New York. Automobile Show. Automotive Dealers Association.

February 8-11.
Flint, Mich. Automobile Show. Automobile Dealers Association.

February 11-18.
Kansas City, Mo. Automobile Show. Motor Car Dealers Association.

February 11-18.
Atlanta Ga. Great Southern Automobile Show. Automobile Dealers Association.

February 11-18.
San Francisco, Cal. Automobile Show. Motor Car Dealers Association.

February 17-28.
Trenton, N. J. Automobile Show. Automobile Trade Association.

February 20-25.
Grand Rapids, Mich. Automobile Show. Automobile Dealers Association.

February 20-25.
Syracuse, New York. Automobile Show. Automobile Dealers Association.

February 26-March 4.
Des Moines, Iowa. Automobile Show. Automobile Dealers Association.

February 27-March 4.
Springfield, Mass. Automobile Show. Automotive Dealers Association.

March 11-18.
Boston, Mass. Automobile Show. Automobile Dealers Association.

SO TO SPEAK

"The dentist said all my teeth must be replaced."
"He said a mouthful."
—*Louisville Courier-Journal.*

PASSING THE BUCK

KINDLY OLD WOMAN: You are a very nice little boy to give your candy to your little friend.

YOUTHFUL HARD GUY: Aw, he ain't no friend of mine.

"Then why did you give him the candy?"

"The flies was botherin' me."—*Youngstown Telegram.*

"What's the use of having a speedometer on your car?"
"To tell you how fast you are traveling, of course."
"Nonsense! The cops will tell you that."—*Life.*

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Repairing Tubular Radiators

The Matter of Inserting New Tubes Is Not Difficult if This System is Used

By Charles Olive

LEAKY radiator tubes can often be repaired by soldering on the outside. When a tube A is broken near its center as at B or near the bottom header, a perfect repair can be made by cutting out the broken part and inserting a new section C large enough to be telescoped over the ends of the cut tube. Use a pair of snips and cut the fins in front of the tube; turning them back till the tube is well exposed. Then with a fine-toothed hacksaw cut the tube above and below the break from D-E. Solder the points after putting the new section in place.

If lumps of solder are found on the ends of the tube, the solder must be removed before the new section is put on. Apply the blow torch to the tube until the solder flows freely, then wipe the tube ends with a piece of cotton dipped in flux. Thus all surplus solder is removed, and well-tinned ends are obtained for attaching the new section.

Putting in the Section

The section is put on in the following manner. Slightly warm the ends, and clean them by immersing in the flux; then dip them in molten solder until they become well tinned both on the inside and outside. If solder hangs to the ends in drops after dipping, melt the solder with the torch and shake off the surplus. The ends of the new section must be widened at F and G so that the section will easily telescope over the ends. The ends can be extended by turning them over a punch or a tapering piece of hardwood till they assume the shape of a small funnel.

The new section should be about one-fourth of an inch longer than the piece cut out, so that there will be a good support at each end. The job can be soldered to a finish with the bit. Then bend the fins back into place, solder them to the tube, and the repair is made.

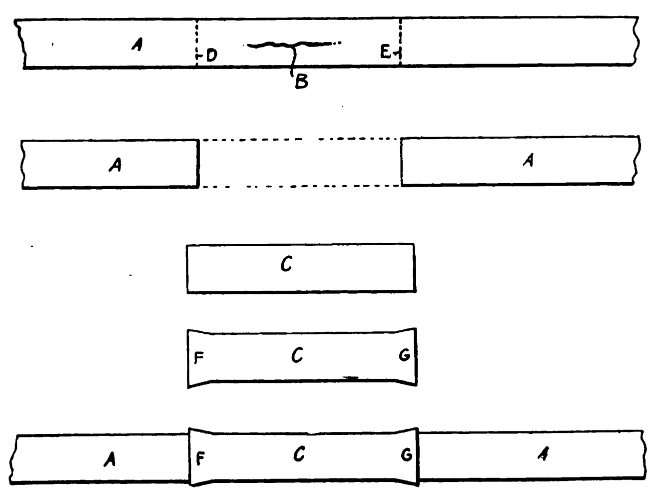
When the leak cannot be repaired except by installing an entire new tube, the best way to go at the job is as follows: Remove the lower tank by melting the solder with the blow torch, and also remove all reinforcements from their supports with the aid of a chisel and the torch. In cases where the reinforcements are soldered together, they must be separated so that they do not seize again as they cool. Follow the side seams with the torch, and as fast as the solder melts, remove it with a stiff brush.

Tap the seams lightly to separate the edges so that there can be no seizing as the metals grow cold. When all the seams are opened up in the way described, play the torch over the entire surface of the work, and at the same time try to get the water connection away. The tank being removed, the ends of the damaged tube can be worked upon easily. Now melt the tube loose from the fins and the header, and play the torch over the tube till the solder melts, when the tube can readily be drawn out.

You are now ready to install the new tube. This must be handled carefully, for it is made of such material that it can easily be crushed or damaged. When you push it into place, use a fine rod fitting inside the pipe. Take out the rod when the tube is in position, and solder by flowing on the inside of the header. It is probably best to use the bit, so as not to disturb the other tubes. After the tube has been soldered to the header, fasten all loose fins to the tube with wire solder, using the bit for this work.

The heating necessary to remove the lower tank often disturbs the solder holding the tubes in the header. Then the tubes must be reset before the tank is put back. To reset the tubes, place the radiator on end, and apply heat evenly, sweeping away the solder with the stiff brush. If there are any spots not tinned, apply acid flux, and tin them well. Then wash the work thoroughly, using water and a brush.

Now place the radiator in a handy position, and cover with flux all places to be soldered. Be sure to reach every spot. Then with your torch burning at full flame,



Various Steps in Repairing Radiator Tubes.

heat four or more tubes at a time till the solder around the tubes and header flows freely, when new wire solder must be applied to fill all openings be they ever so small. Repeat the operation on another part of the radiator till the entire header has been gone over. Solder carefully, or you may have to take the job down again. Black

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spots around the tubes show that you have not done good work, and you had better give the places a little extra attention.

When you are sure that the tubes are tight in the header, replace the tank, and clean its seams with torch and brush in the same way that you cleaned the tubes. Take a light hammer and gently tap the tank along the seams till the two surfaces come together.

Now you are ready to run the seams, and this work you can do with the use of an iron. Begin at one end and run along the side for a short distance, then treat the other end in the same way. Now close up the long seams, being careful, when working around the water connections, not to form any pockets. Put the supports and overflow pipe in place, solder where necessary, and your job is finished.

Nuggets of Automotive Wisdom

Joe's Suggestions This Month Are Intended Mostly for Buick Owners

By Joe Bell

EVERYONE knows how hard it is to get Buick cages out—at times—but all do not think to look to the cage for a loss of compression. Yet there are times when the cage does leak in its seat and the gasket alone will not make a gas-tight fit. Grinding must then be resorted to. The process is similar to grinding in a valve, but in this case the seat is flat instead of being beveled and the cage is turned back and forth in its pocket in the cylinder head. This is rather a tedious job without tools; with tools, it is easier than grinding the valve. The drawing shows a simple form of cage grinding tool—made from a piece of 5/16 rod with a threaded end and two cross pins. This is a very satisfactory holder. It is so simple and effective that it will pay the owner of it in gasoline if he will touch up all of his cages while he has them out—he then is sure they fit clean aid tight at the bottom of the pocket.

An opening in the side of each cage is intended to coincide with one in the cylinder wall, offering a clear, full-size passage for the gases—and it does if the cage is correctly lined up. Most workmen line these up by eye, which often means that the opening is half closed. The best way is each to take a small square as a guide and draw pencil lines at each side of the openings, carryface of both cage and cylinder. When the cage is dropped down in the well and is seen to be out of line (as usually happens), it may be turned before the bonnet is put on and correctly lined up.

THERE are still a goodly number of men who think that the Model 10 Buick was the greatest car ever built. And they *were* good cars—many of them are running to-day that have made from one to two hundred thousand miles "already." During the shortage in cars, vast numbers of these old grey buses were dug out of barns and sheds, cob webs and hay seeds brushed off them, cranked a few times, and away they went. But most of them didn't go until they had been liberally primed, for the carburetors of a decade ago were not made for kerosene. In many cases all these cars—as well as others of the same vintage—needed was a carburetor that would handle present day "gas" and the addition of a heater around the exhaust to warm the carburetor.

One of these modernized old cars was seen not long ago hauling lumber out of the woods, a job at which it had labored valiantly for two years, following a long period of rest. The compression was perfect in each cylinder. The present owner had been given the car and he had put on up-to-date accessories, new rings, and had had the cylinder scores fixed up by the Lawrence process. A peep at the engine showed it to be the prototype of these in the modern "Six," if a four-cylinder-cast-in-pairs engine may be said to be a prototype of a six-cast-en-bloc.

The overhead valve, set in a cage, is a time honored Buick feature. Much of the work which is peculiar to the Buick has to do with these parts and a few of the surprises the new owner gets on the road may be traced to them also. Not that they are troublesome—far from it—but they are constructions rather different from the average.

A new owner pulled into the Empire Garage one day, his face white as a sheet and his car making as much noise as an Erie locomotive. The bonnet over one of the cages had loosened and the cage was slapping up and down with a terrific noise. As the poor owner weakly stepped down, he got a "ha ha" from the boys, who had encountered that trouble before. Owner was advised to always give the bonnet part of a turn extra by driving with a punch after setting up with a wrench, this being necessary to keep it tight. The writer would amend this advice by getting the extra tightness with a longer handle on the wrench, this being more mechanical than driving, which is usually the resort of a slovenly workman.

THE two rocker arms for each cylider turn on a pin set in a little pedestal between the arms. With some of the earlier cars, a period of service developed considerable wear and noise between pin and rocker; this is true to a lesser degree of all the cars though now the pins are harder and the rockers bronze bushed besides being self oiled. The construction permits of an easy

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repair, though it is usually done the long way around. The pins and holes are a sixty-fourth under size. This means that the bushings or rockers and the pedestals that were 27-64" may be reamed out to ⅜" and ⅜" cold drawn steel pins put in—the pins, of course, to be case hardened. It is as expensive to do this as to get new parts but it is much cheaper than to make new undersize bushings and pins, which is the ordinary way of doing the work.

VALVE re-seaters and valve turning devices are superior to lathe work for the same purposes and both ways are quicker than the all-grinding-in method by hand. There are conditions, however, where the hand job is the only way and in such cases a Buick man often spends half a day laboriously grinding deeply pitted valve parts. The amount of material thus removed is considerable and its removal necessitates quite a readjustment of push rods to make up for the loss. Often, the valve is badly worn and the cage nearly perfect—again the wear is reversed; in either case, more or less perfectly good metal is lost by the other member grinding against it. One man situated quite a ways from shop facilities adopted an original scheme to minimize this unnecessary wear. He had an extra valve and an extra cage which he termed his "wearing set." At this periodical grinding session, a deeply burned valve was ground down in the cage of the wearing set before being carefully fitted to its own cage—and the latter was saved just that much. A badly pitted cage was "roughed down" by the valve of the wearing set before the final grinding in. The scheme is one that will bear copying. Occasionally, the wearing set was mailed to a machine shop to have the bevels turned.

IN TRYING to get slightly bent stems out of their cages, a good many cages are cracked in the hub. The cage is merely cast iron, which makes it brittle. The drawing shows how to hold the cage while straightening the valve stem before it can be removed. The safety feature lies in grasping the hub of the cage between vise jaws and thus back up the weak metal where the strain comes. A few blows with a block of wood and a hammer and as many trials and the stem is as good as new—and no broken cage to replace.

ONCE the writer expected to re-grind the valves every three months. It got monotonous and when another owner suggested to "grind them with kerosene," I naturally took notice. It's very easy—all you need is an oil can with a long curved spout or a piece of rubber hose or just a small funnel, depending on what carburetor is on the car and how arranged. When you come in with a nice warm engine, get out this equipment and feed half a pint of kerosene in through the carburetor to the slowly running engine. This keeps the carbon soft and helps carry most of it out and because it is soft the formation of crusts under the exhaust valves is largely prevented. By this practice, length of the periods between grindings are doubled.

KNOWING what your car will do on a certain hill with a certain kind of load is as good a check on its condition as a laboratory test. When my Buick it right, I can go over the Bloomingburg mountain either way on high—and that from a dead start. If it won't do it, it shows that the valves need grinding or the brakes drag or the clutch slips or there's too much carbon in the cylinders or something else. So when it heated up near the top and wouldn't get into Monticello without shifting, we stopped and raised the hood—there it was, the fan belt had parted and gone to rest in the pan!

BUICKS are not rattling cars though many of them are creaky through neglect. The particular fault here considered comes from the rims. Baker lugs and straight side rims are quickly changed but the average owner neglects to go once around for the final tightening of the bolts, with the result that one or all six are just slack enough to let them creep a hair's breadth under driving stresses and this creeping produces the "creak, creak" as Buicks go by. Belts should be tried regularly whether tires have been changed or not.

GARAGES usually have a pinch bar that they use to pry the cage-and-valve unit out of the cylinder. This is often times more "heroic" than mechanical and results in bent stems. A simple straight acting puller can be made as shown. The first piece has a claw that is slipped under the washer, and just above the spring. The second is a section of pipe that drops over the first and also clears the cage well. And the third is any piece of metal resting on the pipe and passing through the first piece where the set screw can press against it and thus draw the cage from its seat.

AFTER a number of years' experience with Buicks, our practice became to drain the crank case every thousand miles. Then to refill with new oil. This makes a sweet running car and is much easier than taking up crankshaft bearing. It is *sine qua non* if one wishes to get the most out of this rather heavy car.

AND when the oil is being changed, it is a good plan to unscrew the case of the oil gauge on the dash and clean the parts. Wash the glass in hot water and brighten the inside of the case—the general effect is well worth the effort even if the increased telltale-ability is not.

Little attentions such as these add wonderfully to the life of a car. One Model 44 Buick in the writer's neighborhood has never had the storage battery out—and the car was bought in April 1917! It reads 1275. It has been kept regularly filled, the car has not been run too much nights, during the Winter lay up season the engine has been run half an hour a month, and the owner uses his crank to loosen up the oil before he starts on cold mornings.

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New York's Automobile Show

The First of the Big National Automobile Shows of the Season Opens In This City

IF you have not already engaged your room in New York City for the week of the National Automobile Show it is high time you did so unless you choose to sleep in Central Park, for all signs point to a busy week for the hotels.

On Saturday, January 7th, the show opens and the "boom will be heard all over the country because it will mark the beginning of a prosperous year in the automobile industry. The fact that the show has aroused interest and enthusiasm is evidenced by the long list of firms which cannot obtain exhibition space.

Dealers and distributors are now imbued with the idea that 1922 will witness a revival of prosperity. People must have cars, must buy accessories because these things increase efficiency. Cars wear out and parts must be replaced and the mere fact that business was poor in 1921 is ample basis for assuming that 1922 will be a banner year.

Grand Central Palace, N. Y. City, where the 1922 National Automobile Show will be held.

Complete details of the decorative scheme have been released by the director general of the display. It has been decided to embellish the purple back-ground with additional gold trimmings. This purple and gold effect will be used on the main floor and grand staircase only; the second and fourth floors being treated with a light blue effect, while the third floor will be trimmed in light green.


S. A. Miles, Manager of the National Automobile Shows of New York and Chicago.

On the main floor there are eight piers, draped with royal purple velour first, then hung with gold tassels with gold emblems at the top. Above the draperies will be willow flower baskets filled with smilax and other blooms. The four pillars and the group pillars will be treated in about the same way except for the gold emblems.

The windows on the four sides of the building will be curtained with royal purple and gold, with a panel in the center on which will be the name of the exhibitor occupying the space.

Throughout the main floor there will be a profusion of smilax, ferns, palms and other foliage and blooms and foliage will be arranged properly on the other floors.

The latest list of exhibitors brings out the fact that there will be 92 different makes of cars displayed; four more than last year. Ten makes of cars will be exhibited for the first time; Ambassador, Bournonville, Durant, Earl, Handley-Knight, Kelsey, Rickenbacker, Wills St. Claire, Itala and Vauxhall. The last two named are the only two foreign cars in this year's display.

More than ever will accessories attract attention, for hundreds of new or improved models of the little appliances and devices representing nearly three decades of steady development will be on exhibition. The average visitor to the show not only studies and examines the cars and body work offered at the exposition, but he or she also finds considerable of interest in the displays of sundries, parts and accessories. In fact there are far more visitors in the market for accessories than for cars, for most automobile owners eternally desire something new on the car.

So many people take genuine pride in their vehicles that they wish to keep


Alfred Reeves, General Manager of the National Automobile Chamber of Commerce, Inc.

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them as up-to-date as possible. This is especially true in such articles as spotlights, windshield ailerons, modern head lamp designs, et cetera—things which prevent the several-seasons-old car from looking too passé.

For 1922, probably the most noticeable feature on many makes of cars will be the changed appearance of the front of the automobile through the adopting of automatic cooling devices. A number of these appeared last season, but the practise has become more general, especially those with thermostatic regulations. Another noticeable feature will be the various forms of vizors, or shades projecting from the top of the windshield frame. Automatic windshield cleaners which operate automatically in rain or snow storms will also be in evidence. These eliminate much of the annoyance of driving under such conditions, as well as tending toward greater safety.

As for the devices designed to protect against theft, there are all sorts of new locks and alleged burglar-proof inventions. Merely relying upon a switch key these days is little protection against the expert car thief, who knows how to get around this by tampering with the ground wire and then departing with the switch locked. Nor does locking the doors of a closed car afford much security, for too many keys fit the same doors. Various ingenious types of gear lever, steering wheel, and ignition locks will undoubtedly interest show visitors. A new device which prevents the theft of the motometer or other radiator cap has appeared on the market.

So numerous are the many devices that will be at the show to name them all would fill columns. The visitor will see the latest in carburetors, batteries, lamps, mirrors, shields, lubricating systems, lubricants, tires, recording devices, automobile hardware, engines, pumps, chemicals, bumpers, safety signals, horns, motor appliances, and parts, shock absorbers, cushions, curtains, clocks, wheels and removable tops and bodies. In fact the accessory section of the national show will be a feature that will be well worth any motorist's attention. The majority of the exhibitors are members of the Motor and Accessory Manufacturers' Association.

Another feature of show week and one that will undoubtedly interest the trade, is the great number of meetings and conventions that will take place during the period. Already these total more than 100 and the list is not yet completed. One of the big events of the week will be the get-together dinner of the "Old Timers." This organization includes men who have been connected with the automobile industry since its infancy, and though the members are widely scattered in different parts of the country they will be in New York City strong during exposition week.

With the stage practically all set, only a few minor details remain to be completed, things will now move swiftly in New York. Every conceivable method of making the coming exposition outshine its predecessors has been employed. The car manufacturers have done their bit by setting a new record; dealers and distributors have contributed their share; General Manager S. A. Miles has put in the hardest two months of his active life, and the show committee composed of H. M. Jewett, chairman, F. C. Chandler and J. Walter Drake, have greatly aided the preliminary work.

A NEGLECTED group of parts that should be oiled is the valve stems. Pointing upwards, surrounded by the springs, very few owners think to oil these parts which are running all the while, metal to metal. At the top of the stem is a cup shaped washer—if this is filled regularly, the oil is bound to work down to the bearing in the cage—cage and stem wear are thus avoided and many a persistent little squeak is nipped in the bud.

WHEN a six cylinder Buick becomes a five and all other causes are investigated, look for a cage that is turned wrong. Either it was not lined up originally so the openings matched or else it loosened enough to allow some unseen action to turn it. Carried to an extreme, the gas would be shut off entirely—and a cylinder that gets no gas will not fire.

THE high cost of spark plugs is an acknowledgment of a careless Buick man. Their location in the side of the cylinder, back of the rods, makes them a bit awkward to get at and a good many times they get hit or the wrench slips in tightening them up—and this may crack the porcelain without the worker's being aware that he has more than touched the plug. It pays to be careful in this respect—the writer knows many Buick four-year-olds that have the original factory plugs in them.

"Hello, old top. New car?"
"No! Old car, new top."—*Lafayette Lyre.*

"There don't seem to be so many burglaries as there were."
"Maybe everything has been stolen."—*Life.*

Low Down—Every man may have his price, but some are so cheap they give themselves away.
—*Petersburg Index-Appeal.*

DESIGN A PORTABLE AUTOMOBILE

With a wicker body and driven by an aerial propeller, an automobile built in England is light enough for two men to carry.

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New and Useful Automobile Accessories

Shrader Announcement

To correct an impression which may exist in the minds of our readers, we have been requested by A. Schrader's Son, Inc., of Brooklyn, New York, to announce that a substantial price reduction has been made on their products, as per the following schedule:

Schrader Universal Tire Pressure Gauge from $1.50 to $1.25

Schrader Universal Truck Tire Gauge from $2.00 to $1.75

Schrader Universa Vave Caps from $.40 a box of five to $.25

Schrader Universal Valve Insides, from $.40 a box of five to $.30

This statement will undoubtedly be of great interest to the trade.

Sterling Jacks

We illustrate herewith Sterling Jack No. 5, manufactured by the Republic Auto Parts Co., 81 Tenth St., Long Island City, New York, which is only one type of the very complete line which this company sells.

When raised, this jack has a height of 16 inches and a capacity of one ton, yet it weighs only nine pounds. This jack is adapted for use on high grade cars. The frame and gears are made of malleable iron. The lifting bar is made of three-quarter inch steel, machine threaded. The extension head, which increases the height, lowered, from nine and one-quarter inches to ten and one-quarter inches, makes it adaptable to cars having different height front and rear axles.

The heavy steel folding handle is 24 inches long and can be folded to 12 inches.

Complete data on the other jacks which this concern manufactures will be given to all those who write.

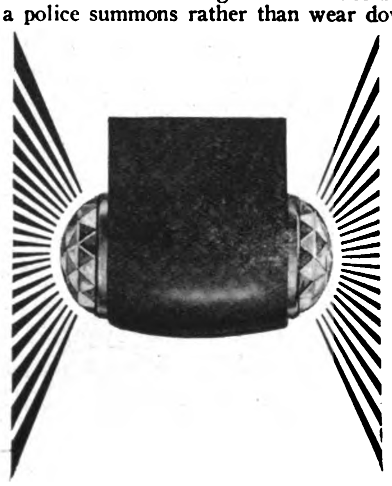
Excelsior Breather and Oil Filler Pipe

A device which is said to prevent oil from spraying over the engine, fan belt and wires of the Ford car is being manufactured by the Excelsior Auto Parts & Supply Co., Brideport, Ct., and called the Excelsior Breather and Oil Filler Pipe.

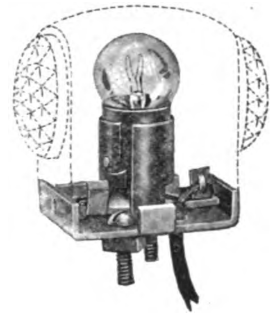
The manufacturers claim that with this device, oil is saved and replenishing of the oil supply made easy, because it is possible to do this without spilling.

Tiffany Parking Lamp

Every driver fully realizes the danger to his own and passing cars when he parks his car without a light burning, and yet he continues to do it risking a serious accident or a police summons rather than wear down



the battery which has so many services to perform. Perhaps it is because the police are getting more strict, but fact remains that the very useful Parking Lamp is certainly becoming most popular—especially in the East.



The Tiffany Mfg. Co. of 50 Spring St., Newark, N. J., are marketing a small and neat Parking Lamp at a very popular price. Instead of consuming two headlights, a tail-light and a dashlight representing twenty candle power, the Parking Lamp burns but two candle power.

The Tiffany Parking Lamp fits flush with the fender and has the appearance of being "built into" the car. The mounting screws and connections are concealed and there are no screws to rust and become unsightly.

Due to its rounded lines and low mounting it is not liable to be caught by passing objects. It has a readily accessible but concealed switch. A *prominent* switch is an invitation to every passing boy to play with the lamp.

An especially attractive feature in the lamp is the very simple operation necessary to replace burned out bulbs. Instead of removing the two small lenses and placing the bulb through the small opening in the usual manner, bulbs are quickly and easily replaced in the Tiffany Lamp by merely snapping off the cover which leaves the lamp socket fully exposed.

A standard candle power, 6 to 8 Volt, double contact bulb is used.

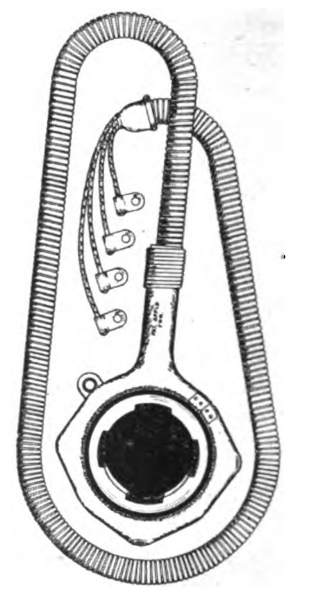
New Faw Catalogue

J. H. Faw Co., 27 Warren St., New York City, have just issued a very attractive catalogue covering all material manufactured and sold by them. This should be very interesting to the trade for it covers this company's complete line and is very neat and compact.

One scarcely thinks of the name "Fawsco" without thinking of "wrenches," so well known is this product of theirs, but a glance through the catalogue shows that they also handle ignition cable, auto fuses, hose clamps, battery connectors, searchlights, switches and many other automotive accessories. Readers should write for this catalogue No. 5, and there is no doubt but that they will find it handy and extremely useful.

The Chief Timer Cover

Ford owners will welcome the new accessory which is being sold by the Chief



Products Company of 616 West Austin Ave., Chicago Ill. This accessory is called the "Chief Timer Cover and Wire Assembly" and is illustrated herewith.

The device is designed to be clamped tightly around the Ford timer and when thus installed protects that unit and the wires from oil and water. The cover is provided with four timer wires, encased in flexible metal conduit which carries the wires to the dash. The same company sell the cover only, without the wiring. The cover or assembly will fit any standard shape Ford timer.

New Era Prices Lowered

New prices and discounts on springs, tire carriers, spring bumpers and visors recently announced by the New Era Spring & Specialty Company of Grand Rapids, Michigan, shows a downward trend in price revision and an upward trend in discounts.

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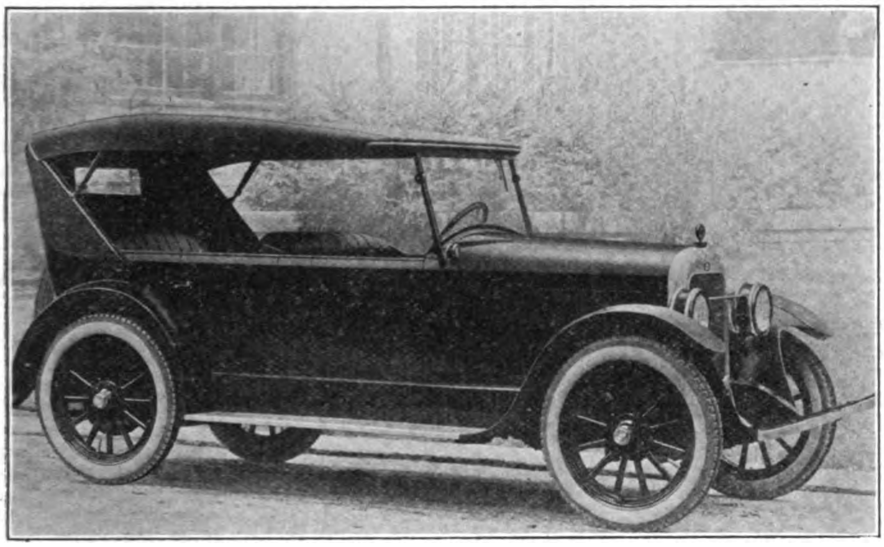
The New Earl Car

On page 7 of this issue our readers will notice a new advertiser, the Earl Motors, Inc., who have but recently taken control of the Briscoe Motor Company. The new Earl car which will be ready for the market shortly will undoubtedly be one of the leaders in its class.

The Earl is available in five different body types, the Touring, which is illustrated, the Roadster, Touring-Sedan, Brougham and Sedan. All of these types are on a standard chassis.

The engine is of the L head type, powerful and economical. It has a bore of 3 7/16 inches and a long stroke of 5¼ inches with an S. A. E. rating of 18 9/10 H. P. The normal speed of the engine is 240 R. P. M. which develops a horse power of 37½.



Earl Model 40 Touring Car.

The crank shaft, which is extra heavy for this size of engine is carefully balanced and supported in three, bronze backed, babbitt lined bearings. Careful workmanship upon this important part insures smooth, vibrationless action even at maximum speeds.

The timing gears are spiral, one inch wide; the crank shaft gear being of steel while the one on the cam shaft is fitted with "fabroil" teeth to insure quiet gear action.

Lubrication is by a low pressure force feed pump to main bearings and timing gears and by splash from connecting rod troughs. The pump is operated by a plunger from one of the cams on the cam shaft with an automatic valve to control the pressure.

The Auto-lite starting and lighting, two unit system is used, the generator being driven from the timing gears and the starting motor acting upon the flywheel through a Bendix drive when starting. A Connecticut ignition head, mounted on the generator furnishes current for ignition in connection with the battery.

The cooling system is thermo-syphon and the water jackets run deep down on the engine. A pleasing feature of the car is its exceptionally large radiator. There is no chance that the engine will overheat under normal conditions, even on the hottest summer day.

Power is carried to the gear-set through a 10" dry plate, Borg and Beck clutch. This unit is mounted in the flywheel and with the engine and gear-set form a unit power plant.

A three speed, reverse, sliding gear type of gear-set is used and the control is at the center of the car. All of the gears and shafts in the gear-set are of chrome-steel, large and heavy to withstand any excessive strain. The main shaft is mounted on ball bearings.

The emergency brake assembly is at the rear of the transmission, an external contracting band operating upon a drum which is in unit with the main transmission shaft. At the rear of this drum is a Thermoid-Hardy universal joint which carries a self centering, ball joint, a feature of the car. The ball joint is lubricated from the gear-set and prevents any "whip" in the propellor shaft. A second joint of the same type is mounted upon the driving pinion, the propellor shaft floating between the two joints.

Since the drive is of the Hotchkiss type, the starting, driving and breaking strain as well as all torque is absorbed by the springs. The universal joints are flexible in all directions and ample slippage space is provided so that no strain can be transmitted from the rear axle to the power plant. The general construction of the frame, the hanging of the power plant, and the position of the rear axle are such that the maximum angularity of the propellor shaft is but five degrees; a fact worthy of note when considering the transmission of power from the gear-set to the axle.

The rear axle is of the semi-floating type. with differential and driving gears of nickel-alloy steel. The gear ratio is 4.66 to one. The differential and rear wheels are mounted on Hyatt bearings, while New Departure radial and thrust bearings are used in the driving pinion assembly. Adjustments of both the pinion and the differential may be made without dis-assembling the axle.

Wood wheels taking 32 by 4 non-skid tired are standard equipment. The rear wheels carry 14 inch brake drums, two inches wide for external contracting brakes. The wheels are equipped with steel felloes and quick demountable rims for straight side tires.

The frame is exceptionally deep and low hung on long semi-elliptic springs. Front springs are 36 inches in length and those in the rear are 56 inches long. The low slung frame and long wheel base gives the machine a low center of gravity and an impression of power and speed.

A complete set of the instruments on the dash board enables the operator to keep informed as to the performance of the car at all times. As regular equipment all models are equipped with a complete set of tools, a spare rim, a windshield wiper and drum type head lamps. The touring car is equipped with drum type side lights for parking and the closed models have a nickeled mirror above the windshield, an adjustable sun visor and a heater.

Those of our readers interested in a completely equipped, quality car should write to the Earl Motors, Inc., of Jackson, Michigan.

Recovering Tops

The Auto Equipment Co., 47 East Canal St., Cincinnati, Ohio, have adopted as their slogan, "Drive One Hundred Tacks—Save Ten to Forty Dollars" because they claim that the car owner, by recovering the top of his automobile, can save from ten to forty dollars. The amount of money saved depends, of course, upon the size of the top being recovered.

This concern supplies each top cut and tailored for the specific size for which it is intended, and they carry a complete stock of top recoverings and back for every make and model of car. All binding and tacks are furnished so that it is a simple matter for the purchaser to recover his car.

When the car's appearance can be improved as cheaply and easily as is possible by this method, we believe it is to the advantage of our readers to write to this concern for more particulars.

Frank M. Comrie Announcement

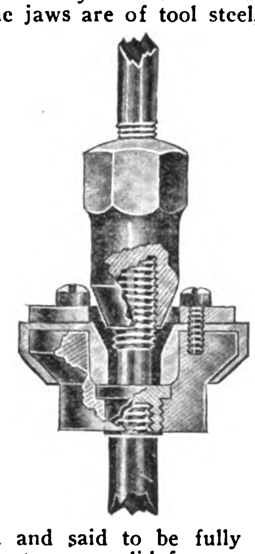
On September 20, 1921, the Frank M. Comrie Co. was incorporated under the laws of the State of Illinois to conduct a general advertising agency and render expert counsel to advertisers.

The address of the Frank M. Comrie Co. is 36 South State St., Chicago, Ill.

The Hoerner Valve Reseating Tool

An interchangeable, adjustable tool, capable of fitting any size valve and re-facing or re-seating same, is being manufactured by the Hoerner Mfg. Co., 3929 Moneta Ave., Los Angeles, Cal., and is called the Hoerner Valve Reseating Tool.

The pilot stems are interchangeable and it is claimed they will fit accurately to any size. The jaws are of tool steel, properly



hardened and said to be fully as strong and accurate as a solid facer.

The manufacturers state that though the interchangeable and adjustable features of the Hoerner tool takes the place of ten various sized tools ordinarily required, does the work fully as accurately and has an added advantage in being adjustable to "off" sizes.

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A. O. Smith Corporation Puts Out New Running Board.

Investigation in the service station and accessories field indicates a ready acceptance of the new one-piece pressed steel running boards developed in the engineering department of the A. O. Smith Corporation of Milwaukee. This company, wellknown as manufacturers of automobile frames and other pressed steel parts, is now marketing two types of running boards intended to replace the wooden running boards which have for one reason or other remained practically unchanged in spite of many other motor car improvements.

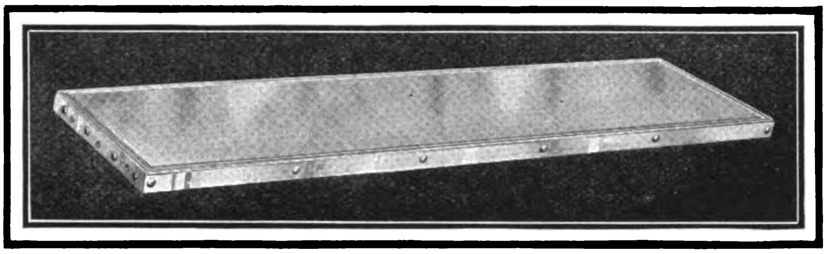


Fig. 1. Smith one-piece pressed steel running board with aluminum covering.

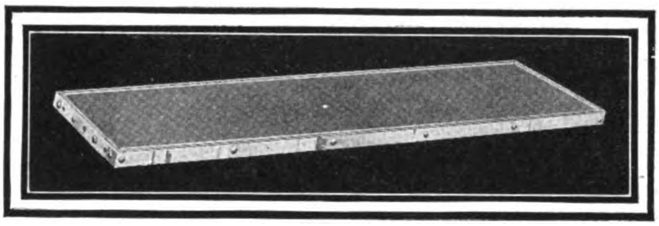


Fig. 2. Smith pressed steel running board with linoleum covering.

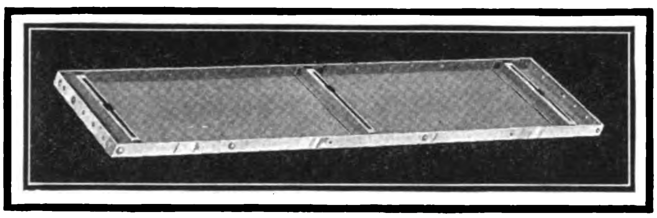


Fig. 3. Underside of Smith pressed steel running board showing construction.

One type of Smith Board has the conventional linoleum covering, while the other is topped with a single sheet of aluminum. The manufacturers claim that a pressed steel running board, not being subject to swelling, warping and rotting, retains its original appearance after years of service. There is no loosening of bolts possible, the pressed steel construction actually adding to the strength of the frame and giving better support to both front and rear fenders.

Service men know that in repairing or replacing wooden boards the carriage bolts do not hold, making it necessary to tear up the linoleum covering. The new all-steel boards are said to eliminate all these troubles, providing standard made-up boards for all makes of cars so that with a small stock, replacements can be taken care of immediately. The illustration shows the under side with arrangements for accommodating the brackets.

Advance Adds to Facilities

Advance Automobile Accessories Corp., Chicago, has absorbed The Rochester Woven Belting Corporation of East Rochester, N. Y. This plant is known among the jobbing fraternity as the "Empire Plant."

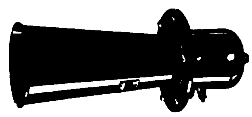
Milwaukee Timer Manufacturer Changes Corporate Name

On November 1st the corporate name of the Milwaukee Auto Engine & Supply Company, Wilwaukee, Wisconsin —manufacturer of the well known Milwaukee timer for Fords—was officially changed to Milwaukee Motor Products, Inc. The change is one of name only—there has been no change in the personnel or policies of the company. The new name was finally decided upon because it was considered simpler and more appropriate to the business.

Klaxon Automobile Warning Signal

The first electric motor driven horn, the Klaxon 20-L, was built by the Klaxon Company, Newark, N. J., in 1908. This horn is standard equipment on the most expensive cars.

Ever since its appearance, owners of medium and small sized cars have wanted a horn having the same dependable warning power—at a lower price. At last they can have it.



The new Klaxon 12-A recently announced by the Klaxon Company has the same deep, powerful, unmistakable note which is produced by the highest priced Klaxon, yet this new signal costs considerably less.

The workmanship and the materials in this new signal are of standard Klaxon quality. The signal bears the standard Klaxon guarantee and is backed by the nation-wide Klaxon service. The low price is made possible by a simplified construction requiring less labor and material.

The new Klaxon 12-A is finished in a smart black baked enamel with an orange rim. A unique feature is its three-legged universal bracket. By means of this new bracket, the Klaxon 12-A may be mounted on the dash—under the hood—of practically all makes and models of motor vehicles.

Deliveries of this new Klaxon will start at once.

New Type "Wickey" Battery

Arrangements for manufacturing and distributing on a national scale a new type storage battery, different in construction and performance from the wet acid batteries in common use, are being made by the Wickey Battery Company of East Chicago, Indiana.

While this battery has been manufactured for the past three years, operations have been purposely limited during this time, to permit thorough testing of the battery both in the Wickey plant and on the road in actual use.

The principal arguments advanced for the new Wickey Battery are, that this battery *does not* require the regular care and attention which other batteries *must have;* that it is practically trouble proof; that it is non-freezable; that it operates efficiently without water for periods ranging from three months to six months, or even longer, depending on the conditions of service. The battery is guaranteed for three years of service.

It is called a semi-dry battery. The acid and water electrolyte of the wet acid battery is displaced by a semi-solid mixture, the Wickey Formula Electrolyte Compound. There are no separators such as are found in wet acid batteries. Instead, there are Strip Isolators which occupy but a fraction of the space ordinarily given to separators. These Strip Isolators are narrow strips of hard rubber: three Isolators, one at each end and one in the middle, are fixed permanently between each plate. Practically all the space between the battery plates is occupied by the Wickey Electrolyte Compound. Since this Compound is semi-solid, the battery plates are always entirely covered, the Compound acting as a protector and "feeder" for the plates. The Compound does not evaporate and the evaporation of water which is added at long intervals is hardly noticeable. This compound is non-corrosive.

With nothing to retard the circulation of current, the Compound forms a free and unrestricted path for the free and constant flow of electricity within the battery cell. To this free circulation and because of the elimination of "wall" separators, is at-

tributed much of the remarkable performance of the Wickey Battery.

Many severe and unusual tests have been put to the Wickey Battery. It has been found that the battery will function perfectly while frozen in a cake of solid ice, or

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Taking the Ire out of truck tires

NOT so long ago shops had to be especially equipped to remove worn out truck tires and even with the necessary press it was no easy job.

Now, thanks to the oxy-acetylene cutting torch, the most stubborn tires are sliced off quickly and economically without in any way damaging the felloe band.

Prest-O-Lite Dissolved Acetylene has increased the usefulness of oxy-acetylene a hundred fold because it enables *any* shop to employ the process.

Through a nation-wide system comprising forty plants and warehouses an unlimited supply of highly pure gas is constantly available to welders and cutters the country over.

Prest-O-Lite

DISSOLVED ACETYLENE

THE PREST-O-LITE COMPANY, Inc.

General Offices: Carbide and Carbon Building, 30 East 42nd Street, New York

Balfour Building, San Francisco

In Canada: Prest-O-Lite Co. of Canada, Limited, Toronto

PW-508-21

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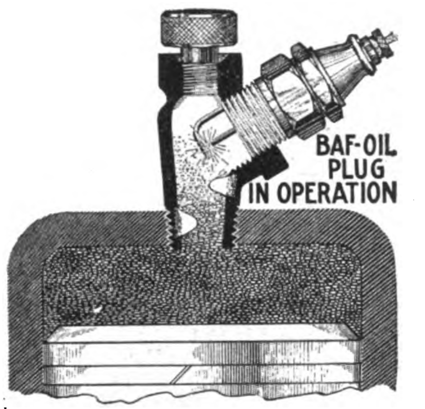
while totally immersed in water. Other tests have shown that the plates will not buckle—a short circuit, even when strong enough to melt nails or iron bars will not injure the battery.

Gemco Baf-Oil Plugs

The Gemco Manufacturing Company, Milwaukee, Wisconsin, have recently taken over the manufacture and sale of the Bafoilizer, formerly introduced by the Protectometer Company, Chicago, Illinois. It will be known hereafter as the Gemco Baf-Oil Plug.

These plugs are combustion chambers



into which the spark plugs are screwed in the usual manner. In each chamber are two baffle plates which prevent the oil from reaching the firing points. Each plug is a unit in itself and has no mechanical contrivance to wear out or cause trouble. In the Baf-Oil Plug, it is claimed, oil is prevented from reaching the firing points and is not burnt into carbon which is harmful.

A priming feature is included in the half-inch size which adds materially to its usefulness in cold weather.

The baffle plates prevent the oil from reaching the firing point and become extremely hot when the motor is in operation and, it is said, act as hot spots which completely vaporize the gas. When the spark occurs, the highly vaporized gas in the combustion chamber ignites and shoots into the cylinder proper causing a clean explosion that increases the power of the motor and reduces carbon deposit.

Baf Oil Plugs are made in two sizes the half-inch standard selling and the seven-eighth-inch. They are packed in an attractive display carton, one dozen to a standard package.

An attractive folder will be sent to anyone writing the Gemco Manufacturing Co., Milwaukee, Wis.

Ped Automatic Signal

The Ped Automatic Signal, which is sold by the P. E. D. Corporation of 30 Church St., New York City, is a combined automatic stop and turn signal, a tail light and a license plate holder.

It fits any make of car and is completely automatic. Each time the brake is applied the word "Stop" automatically flashes, and warns the driver of the car in the rear. Each time a right or left turn is made, the arrow indicating the direction, automatically flashes the direction in which you are turning.

Sometimes, when a driver gets into a "tight place" he has many things to think of at the one time, and it is then that a device of this sort is almost indispensable, allowing, as it does, the operator to concentrate solely on the operation of the car, and allowing the signaling to take care of itself.

Full details regarding this device may be obtained by writing to the manufacturers.

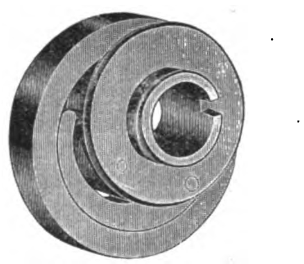
The Jambor Timer

Believing that much of the ignition trouble on the Ford car is due to faults within the timer the Jambor Tool & Stamping Co. of Milwaukee, Wis., is marketing a number of styles of timers which replace the stock unit used on Ford cars.

In making an analysis of timer troubles this company has come to the conclusion that irregular engine action is usually due to unevenly worn commutators. The fibre and steel segments wear out of round and the wavy surface of the commutator causes the engine to skip. The company has traced the cause for this uneven wear to the rotating member. The roller, as our readers know, is mounted on a steel pin and this pin wears rapidly until the roller jumps back and forth against the fibre and steel segments.

To obviate all chances for such action the Jambor Tool & Stamping Co. has designed the rotating timer member illustrated herewith. The center member fits over the end of the cam-shaft in the same way as the ordinary Ford roller. This member carries a hardened steel eccentric upon it and this eccentric is designed to make a smooth rubbing contact against the timer contracts. Such is the construction that there is practically no chance for "wavy" wear.

This timer is being sold by the A. G. Sales Co., of 119 W. 63rd St., New York City.



New Gill Piston Ring Directory

What is probably the most complete and authentic piston ring size directory ever published, has just been issued by the Gill Manufacturing Company of Chicago, Ill., for the convenience of the trade.

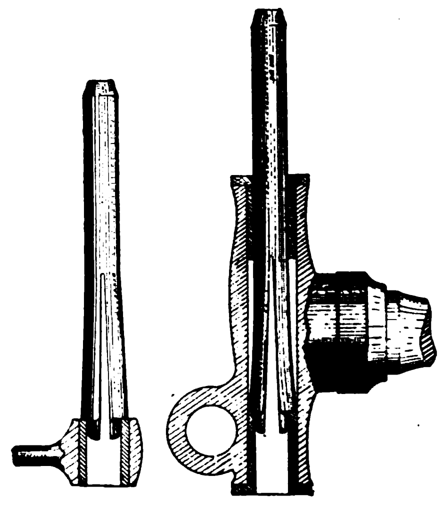
The purpose of this book is to simplify the sale of piston rings by means of a single, compact volume containing the piston ring size data of the entire automotive industry. To this end, every make of automobile, truck, tractor, and aeroplane manufactured has been catalogued as far as possible, with a tabulation of past and present models, number of cylinders, piston rings, and the piston ring sizes required for each. Stationary and marine engines are also included.

An idea of the vast amount of labor necessary to complete a work of this kind is gained from the announcement that the entire time and efforts of a special department were required during the period of more than a year. To facilitate the preparation of the 1922 issue and for the purpose of providing up-to-the-minute information covering piston ring sizes, this department is to be retained in its present duties.

Although the book has been sent to every service station, garage, repair shop, jobber and accessory store—making a total circulation of 81,000 copies—additional copies can be secured without charge by addressing the Gill Manufacturing Company at Chicago, or any of its jobbers or branch offices.

New Rose Bushing Remover

The Frank Rose Manufacturing Company of Hastings, Nebraska, are continually adding to their already large line of Automotive Necessities. Just now they are placing on the market a Bushing Remover of novel design. It consists of a steel drift split to give it tension. On the end are two small pilots serving to keep the remover in correct alignment on the



bushing when the remover is used for drifting bushings where the casting itself does not serve as a guide.

It is said to be particularly desirable for removing spindle bushings, tie rod bushings, and spring perch bushings, etc. At present it is made in two sizes one for Ford, and one for Dodge, each of which will fit many other makes and models of cars.

New HB Automatic Air Compressor

A new automatic air compressor pump mounted on its air tank, is being manufactured by the Hobart Bros. Company of Troy, Ohio.

The makers guarantee the outfit to maintain a constant air pressure at all times, day and night, on your air lines without attention, once the outfit is properly installed.

The outfit is compact, yet of ample capacity for service station use. The latest exclusive HB feature is the magnetic pressure release which enables the motor to start without load, saving current and always guaranteeing an instantaneous start.

Gearless, ball bearing, automatic, unusually quiet and easy payment terms describe this outfit's special features.

The low speed ball bearing compressor type motor is built directly in the pump, the motor shaft being the part of the pump shaft, making the motor and pump one compact unit. Air and oil filter, safety valve gauge and tank are all standard equipment with this outfit.

Operates from lighting or power lines. The makers claim the easy terms on which these outfits are sold make it possible for the small shop to furnish satisfactory air service. The unusual compact size of this outfit makes it most desirable for oil service stations where space is limited.

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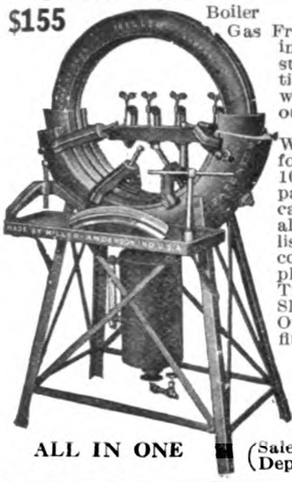
COMPLETE TIRE REPAIR OUTFITS

$155



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Write for 108 page catalog listing complete Tire Shop Outfits.

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Makes any repair 2½ to 5½ Tires

Boiler Gas $157. Gasoline $168. Steam Line $129

Established 1894

CHAS. E. MILLER

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INCREASE POWER

PRESSURE PROOF PISTON RINGS

PAT. MAR. 2, 1915—FEB. 29, 1916

will restore the original power of the weakest motor. Lost power is usually the result of accumulated carbon or lost compression. Pressure Proof Rings permanently prevent this by making it impossible for either oil or gas to leak by the piston. Recommend and install Pressure Proof rings — it will pay in good will as in dollars and cents.

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Canada: Pressure Proof Rings, Ltd.,
Sun Life Bldg., Sherbrooke, Quebec

Sterling Twin Gear Jacks

Our 1922 Models will lift any touring car without crawling under. Long folding handles.

Send for catalog of 15 sizes. Prices $1.50 up.

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IDEAL FOR GARAGES
Scaife Copper-Brazed

AIR TANKS

Will positively hold air indefinitely without loss of pressure.

MADE IN ALL SIZES

We also manufacture "Scaife"

Gasoline Storage Outfits

The cheapest thoroughly practical system.

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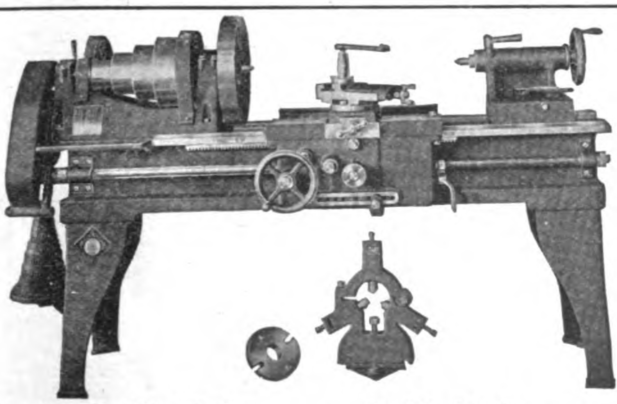

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9 to 18 inch swing

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W. F. & JOHN BARNES CO.
122 Ruby St., ROCKFORD, ILL.

Investigate LATEST

"WHITNEY"

HIGH EFFICIENCY
ROLLER AND SILENT TYPE

CHAINS

also *Low* Cost per *Thousand Miles* of Service

LATEST ROLLER CHAINS HAVE SPECIAL QUALITY SOLID ROLLS AND OTHER IMPORTANT IMPROVEMENTS

Front End Motor Chain Drives

EXCEPTIONAL MILEAGE AND NEVER KNOWN TO SKIP THE SPROCKET TEETH

THE WHITNEY MFG. CO.
HARTFORD, CONNECTICUT, U. S. A.

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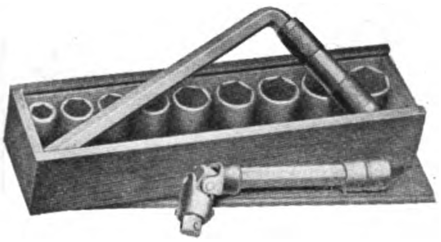
Boston No. 3 Socket Set

A most complete socket set is being manufactured by the Boston Auto Tool Co., 17 Tudor St., Cambridge 39, Mass., called the "The Boston" No. 3. This socket set is made of a special steel and the sockets are heat treated.

The sockets are much shorter and are tapered to a thin edge, permitting them to be used in places where it is claimed sockets could not be used before, and it is said when used in connection with the extensions, "T" handle, Ratchet and universal joint, there is no bolt or nut that cannot be reached.

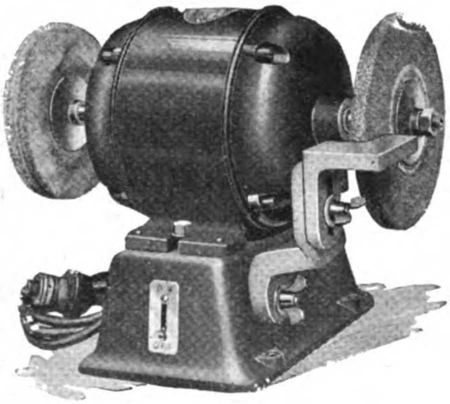
All tool ends have spring pressed friction balls, which hold the various combinations in place. Some 290 combinations can be made with these tools.

They are sold with the understanding that if a socket should break, it will be replaced if the broken piece is returned to the manufacturers.



The Marathon O K Grinder

We illustrate herewith a combination grinder, buffer and general utility tool made by the Marathon Electric Mfg. Co.



of 34 Island St., Wausau, Wisc. The machine may be had to run on either direct or alternating current. It may be obtained to run on single, two or three phase, 60 cycle, 110 or 220 volt A. C. or 32, 110 or 220 volt direct current.

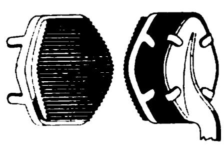
Its low speed of 1740 R. P. M. makes it particularly adaptable to garage work since it permits the use of large size grinding wheels. The machine generates ¼ H. P. and is covered with a one year guarantee against defects in workmanship.

Not only is the machine adaptable to general garage work such as grinding and buffing as well as tire cleaning work but it is cheap enough for the average car owner who wishes to use it for general work in "tinkering."

Non Skid Pedals

If you believe in non skid tires you surely must realize that the same principle could be applied to brake and clutch pedals to great advantage. Have you not often had your foot slip from the metal pedals? Then again, the metal pedal soon wears a hole in the sole of your shoe if the latter is not protected.

To obviate these troubles the Auto Pedal Pad Co., Inc., of 318 West 52nd St., N. Y.



Patent Pending

City, are marketing a corrugated rubber pad, mounted in a nickeled frame, for attachment to clutch and brake pedals.

These pads can be obtained to fit practically any car on the market, or rather any pedal on the market for they can be applied to accelerator and starting pedals as well. Our illustration shows a special feature of the pedal. The regular pedal pad is fairly large, while the Ford pedals are small. In order that the comfort of a large pedal on the Ford may be had the Pedal Pad Company furnish a special steel adapter plate with the large pedal when ordered for Ford cars.

The adapter plate fits into the regular pedal pad and carries an extra set of lips which bind around the Ford pedal. The illustration clearly shows this feature. All pads are made from high grade solid rubber, deeply corrugated and firmly secured in a steel frame, nickel plated. The pads are fastened to the pedals by turning over the four projecting lips around the pedal.

New Mueller Battery Handle

The Mueller Electric Co., 2135 Fairmount Road, Cleveland, Ohio, recently placed on the market their No. 10-A wire type storage battery handle which they offer either plain or lead coated. The feature of this device is a four-finger grip with legs on one and five-eighth inch centers. This is the standard drilling with most box manufacturers.

Sharpe Ever-Ready Auto Windshield Pad

One of the newest devices which is attracting marked attention is being manufactured by the Sharpe Chemical Co., 403 Stevens Bldg., Detroit, Mich.

This accessory is called the "Sharpe Ever-Ready Auto Windshield Cleaner Pad" and is made of genuine leather which is covered with a cloth that has been chemically treated in a scientific manner and is

said to last during the life of the average car.

It is claimed that a single application of the pad each time a storm is encountered will produce a clear vision glass. The device is made in a convenient size to fit the motorist's pocket or the car pouch.

This company invites correspondence from car owners, jobbers, and dealers.

MAKE THE PROFIT FOR YOURSELF!

Reboring done right—right in your shop

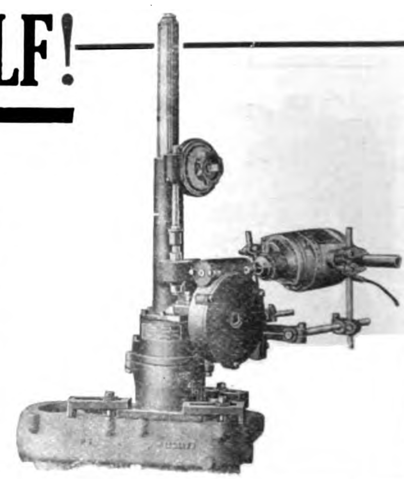
Your customers come to you because of their confidence in your doing the job right. So that it is not fair to them—fair to yourself—to have to be responsible for cylinder reboring by another.

Equip with "THE YORK" and do the job right, right in your shop; Get all the profits, not a meagre 10%.

Write for details of "THE YORK." Hand or electrically driven, bores any motor block from 2 1/2" to 5 1/16"—Write for catalogue.

"The YORK" Boring Machine

The Winterknight Equipment Co., Philadelphia, Pa.



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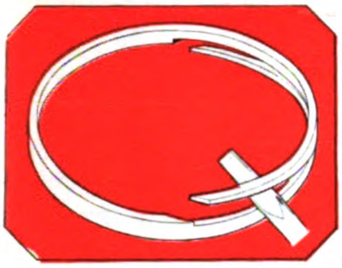

THE STAR-K INLAND is premier among high class piston rings. One piece, spirally cut and specially heat treated, it uncoils like a spring against the cylinder walls, producing a gas-tight, oil-tight fit, snug, but not binding. The overlapping ends being flexible, these rings readily adjust themselves to irregularities in the cylinders and they "follow the wear."

THE STAR-K OILESS is a popular priced ring of remarkable quality.
Price, 50c and up, depending upon size.
Oiless because of the double groove feature — one in middle for lubrication; one on lower shoulder to scrape down the oil.
Quick-sealing because of the velvet finish that causes the ring to "wear in" quickly, producing maximum efficiency in the shortest possible time.

Why Star-K Piston Rings Stay Round

It gets intensely hot in the cylinders of an automobile engine—so hot that, unless the piston rings have been properly "treated by heat" they warp out of shape and let compression slip by at every piston stroke.

Star-K Inland and Star-K Oiless Piston Rings are heat treated by a process that fixes their circular form permanently. They simply can't warp when the heat in the cylinders reaches them.

All piston rings that leave the "Star-K" factory are easy to install because they are always true to size. Each must pass micrometer tests that do not allow variations of more than 1/2 of one thousandths of an inch.

That's why these rings are always easy to install—why they always please your customers and help hold your trade.

A good combination for oil pumping motors is two Star-K Inlands and one Star-K Oiless.

STARK-INLAND MACHINE WORKS, St. Louis, Mo.

E-147-a

★K

TRADE MARK
REG. U.S. PAT. OFF.
AND
FOREIGN COUNTRIES

OTHER STAR-K PRODUCTS

Star-K "Breather" Spark Plugs.
Price, $1.50 each.

Star-K Shurnuff Junior Spark Plugs.
Price, $0.90 each.

Star-K Shurnuff Grease Retainer for Ford Cars.
Price, $0.90 each.

Star-K Shurnuff Ventilating Windshield for Ford Cars.
Price, $7.50 each.

Star-K Shurnuff Combination Manifold for Ford Cars.
Price, $9.00 each.

The Star-K Shurnuff Running Board Supports for Ford Cars.
Price, $3.90 per pair.

For further particulars write us.

STAR-K INLAND

ONE-PIECE PISTON RINGS

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FOR THAT DISTINCTIVE TYPE OF MOTOR CAR

A projector of unusual illuminating power

L'ÉCLAIREUR lamps are a high class product, equipped on the finest types of cars, such as Packard, Cunningham, Pierce-Arrow, Locomobile, Marmon, Lincoln, McFarlan, Cadillac, etc.

Finished in full polished NICKEL with "SUPERIOR" LEGALIZED PRESMATIC LENSES. Fastidious motor car owners should specify L'ÉCLAIREUR motor car lamps of unique pattern.

Write Department "L"

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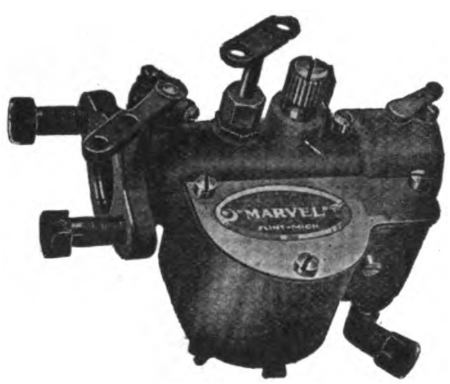
150 W 52nd St., New York City, U. S. A.
Branch: 313 Halsey St., Newark, N. J.
See our Exhibit, Space C-24, 3rd Floor, N. Y. Auto Show

FORD SPECIAL



MODEL "N" $10.00 f. o. b. Factory

Review in your mind the important part carburetion plays in your motoring experience.

Isn't it more satisfying to have a carbureter that can be depended on to function under all conditions?

Marvel performance, economy and durability is an established fact, backed by the judgment of some of the largest automobile manufacturers.

MARVEL CARBURETER CO.
FLINT, MICH.

CYLINDER GRINDING

Pistons Piston Rings Piston Pins

Now located in our new modern plant
The Home of the Bunite Piston.

Best Equipment Skilled Mechanics
Quick Service

BUTLER MANUFACTURING CO.
3234 West Washington St., Indianapolis, Ind.

Trouble Department

(*Continued from page* 41)

each push rod when it is at its lowest point. Make the mark even with the edge of the push rod bushing or guide. Then turn the engine over until the push rod is at its highest point and mark it again. The distance between the marks indicates the travel of the push rod. The distance traveled by each push rod should be the same. Any discrepancy indicates either a faulty cam or a bent cam shaft. If only one push rod traverse is different from the others, it is an indication of a faulty cam but if two or three are different from the others, then the cam shaft is probably bent.

The remedy for this is either a new cam shaft or the repair, by a service station of the old one. Of course a bent cam shaft will cause a knock, and unless all of the valves open the same amount there might be such an uneven action that a knock would result.

Repairing Ford Magneto

3057

From A. D. Harskins, Canada: Will you please tell me how to shim up the Ford magneto assembly to produce more power in the magneto?

Reply: The distance between the permanent magnet binding pieces and the ends of the electromagnets should be equal to the thickness of a thin business card. In making the adjustment, as directed below, you should be careful to test the assembly all the way around.

By this we mean to say that each magnet binding piece should be the same distance from every electromagnet. the flywheel should be moved forward so that a set of magnets come over the electromagnet poles and the card inserted, all the way around, between the various binding pieces and the electromagnet poles. The flywheel should then be moved forward the distance of one magnet assembly and the same measurement taken until all pairs are adjusted.

In making the adjustment two courses are open, either the whole electromagnet assembly may be shimmed backward to bring it nearer to the flywheel or the permanent magnets may be moved forward. It is also possible, if due care is exercised, to bend portions of the electromagnet assembly plate. However, the last mentioned method should not be adoptd unless necessary.

The electromagnet assembly plate is held by four cap screws to the housing. Remove these cap screws and cut a gasket from sheet iron or manilla paper. Put the gasket between the housing and the assembly plate. This will bring the magnets nearer to the flywheel.

If only a few of the permanent magnets are to be moved forward, then remove the binding pieces and insert a copper or brass washer between the magnets and the shoulder on the post. This will bring the magnets and the retaining pieces toward the electromagnets.

In replacing the magnets be sure to put them back exactly in the same relative positions as before for if the poles are reversed the output will be decreased.

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FUR LINED OVERCOATS

Black wool kersey cloth, lined with beautiful dark brown marmot fur. Handsome marmot fur collar, double breasted, full length, sizes 36 to 46, ready for immediate delivery. Your opportunity to secure a handsome garment at pre-war prices.

Price $42.50

Usually retailed at $75.00. By buying direct from manufacturer, you save all middlemen profit and take no risk.

SENT FOR EXAMINATION

Examine and try on before paying. Write at once stating chest measure, height and weight. Enclose $1 for express charges only and coat will be sent at once.

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518 West 134th St. New York

Kleradesk

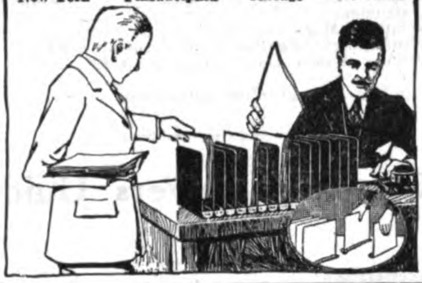
Saves time distributing papers

Automatically sorts and routes mail, memos, orders, etc., for all to whom mail is distributed. It holds reference papers out of the way but immediately at hand when needed. Very convenient.

A Steel Sectional Device

Add compartments as required. Sections $1.20 each. Fifteen-compartment Kleradesk illustrated below only $19.20. Indexed front and back. Write for free, instructive, illustrated folder, "How to Get Greater Desk Efficiency."

Ross-Gould Co., 109 N. 10—St. Louis (2)
New York Philadelphia Chicago Cleveland



The Universal Motor Service Lathe

14-24" Sliding Extension Gap Lathe

Just the thing for Garages and Motor Repair Shops.

A high-grade lathe with a wide range of usefulness, at a very reasonable price.

The Universal is strong, durable and accurate. It will cut right and left-hand threads, and millimeter threads. It is capable of perfect work on all kinds of milling jobs, taper work and cylinder reboring.

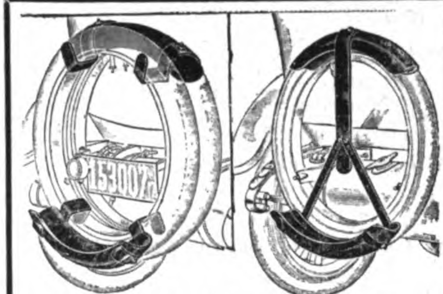
No motor repair shop can afford to be without this high-grade, reasonably priced machine. Drop us a line, and ask for new bulletin and latest prices—it will start you on the road to bigger profits.

BARNES DRILL COMPANY
818 CHESTNUT ST. ROCKFORD, ILLINOIS

ZIP Friction Paste
for fitting-in bearings

Write for Sample Tube Sent FREE

ZIP MFG. CO. Denver, Colo.
ZIP ABRASIVE CO. Cleveland, Ohio



Patented Sept. 18,'17; Jan. 27,'20; Aug. 10,'20.

Carries as Many Extra Tires as Desired. Fits Over Any Rear Tire.

2--R--3

(Spare) Tire Carriers

The second extra tire is supported by the first, the third by the second, the second, etc. Strap all together on both sides. Write for further particulars; our full line will interest you.

The International Stamping Co.
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Automobile Hardware

Door Locks Handles
Door Hinges Mouldings
etc.

JOS. N. SMITH & CO.
Detroit Michigan

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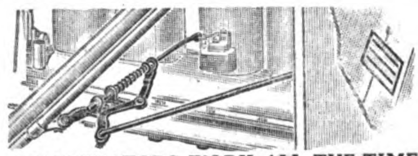

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Only two parts, direct drive from pedal to carburetor pull rod. Does not attach to floor boards or interfere with their removal, replace carburetor pull rod by merely changing two cotter pins. Quick and easy to install. GIVES THAT EASY AND POSITIVE MOTION

Fits all Ford Cars.

Price $1.50, West of Rockies $1.75, Canada $2.35

HEATON-AULT, 6249 Greenwood Ave., CHICAGO

BURD

***Quick-Seating* PISTON RINGS**

Burd High Compression Ring Co.
Rockford, Ill.

DRIVE 100 TACKS AND SAVE $25.00

Easy to put on. We furnish instructions. We tailor top recoverings for all cars and guarantee them to fit. Ford Roadster, $5.50; Touring, $6.95; other cars, $14 to $16, delivered at your door. Seat covers $3.10 up. Ford side curtains that open with doors $11 to $16.

Write for Catalog and Samples

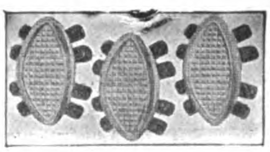
AUTO EQUIPMENT CO., 47 Canal East, Cincinnati, O.

Electric Trouble Shooter

AMBU

Detects and locates, quickly and accurately, trouble in any American made starting and lighting system used as standard on any American made car.

AMERICAN BUREAU OF ENGINEERING, Inc.
1603 S. Michigan Ave. Chicago, Ill.



"RICO"

Ford Pedal Covers

one set will outwear three sets of any other kind.

Price per set of 3—75c

Rich Mfg. Co.
69-71 Greene St., N. Y.

$1 Less Than Pre-War Price

Famous Milwaukee Timer — the largest selling Ford replacement—now retails at $2 (west of Rocky Mts., $2.10). Guaranteed in quality and workmanship. Sold by 94 per cent of all auto supply jobbers and thousands of dealers.

MILWAUKEE MOTOR PRODUCTS, Inc., Milwaukee, Wis.

MILWAUKEE TIMER for FORDS

MOULDINGS and PYRAMID MATTING

for Binding and Trimming Running-boards, Floor-boards and Bodies

MANUFACTURED BY

THE C. SPIRO MFG. CO.
New York and Indianapolis

KENNEDY AUTO STORAGE COVERS

Furnish efficient and economical protection for cars in dead storage. They are made of heavy, durable paper, in standard sizes to fit any cars.

MADE ONLY BY

THE KENNEDY CAR LINER & BAG CO.
Shelbyville, Ind.
Canadian Factory at Woodstock, Ont.

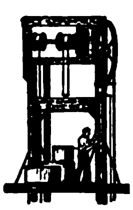
Bayley's Automatic Spark Plug Terminal (B. A. T.)

For Automobiles—Motorcycles—Motorboats—Aeroplanes

Instantly connected—instantly disconnected. "The Button does it!" Forms a rigid contact. The Spring locks it! Attached by hand—no tools needed.

4 B. A. T. Terminals for $1.50

B. A. T. Terminal Co.
105 Vanderveer St. Brooklyn, N. Y.



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AUTOMOBILE, HAND AND POWER

For Garages, Warehouses, Etc

SIDNEY ELEVATOR MFG. CO
Cor. Miami and Shelby Sts.
SIDNEY, OHIO

Forty Thousand Dealers *are selling*

BENFORD'S

Golden Giant Spark Plugs

Get Your Stock Ready!

Ford Generator Armatures Rewound

$2.50 net each,

any quantity, other types of two unit Generator Armatures $5.50 net each. We do not rewind motor generator armatures. Delivery 1 to 2 days.

H. M. FREDERICKS CO.
Lock Haven, Pa.

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Index to Advertisers

Classified Buyers' Guide

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LYON RESILIENT BUMPERS
Famous patented opened loop-end construction quickly and easily attached to any car.
METAL STAMPING COMPANY, Long Island City, New York.

Big Profits Charging Batteries

$20 Brings an HB Battery Charger
Almost a year to pay balance on easy terms. Made in sizes for 6, 10, 16, 32 or 70 batteries. Let us recommend size to make you most money. Free trial or money back guarantee.
Hobart Brothers Co., Box D117 Troy, Ohio.
$150 to $300 Monthly Profit

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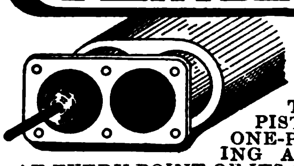
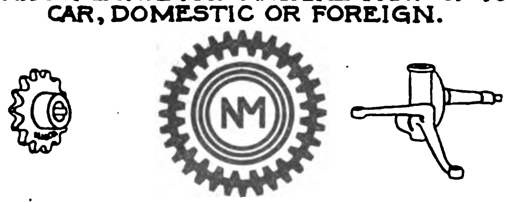


NEW OVERSIZE PISTONS "FLEXO HAMMERED" PISTON RINGS & WRIST PINS. THE "FLEXO HAMMERED" PISTON RING IS A CONCENTRIC ONE-PIECE HAMMERED RING GIVING A LIGHT UNIFORM PRESSURE AT EVERY POINT OF ITS CIRCUMFERENCE. SEND FOR DESCRIPTIVE LITERATURE.

GEARS and SPROCKETS OF EVERY DESCRIPTION

WE CAN DUPLICATE ANY MACHINE PART OF YOUR CAR, DOMESTIC OR FOREIGN.



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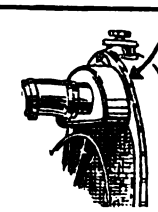

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING

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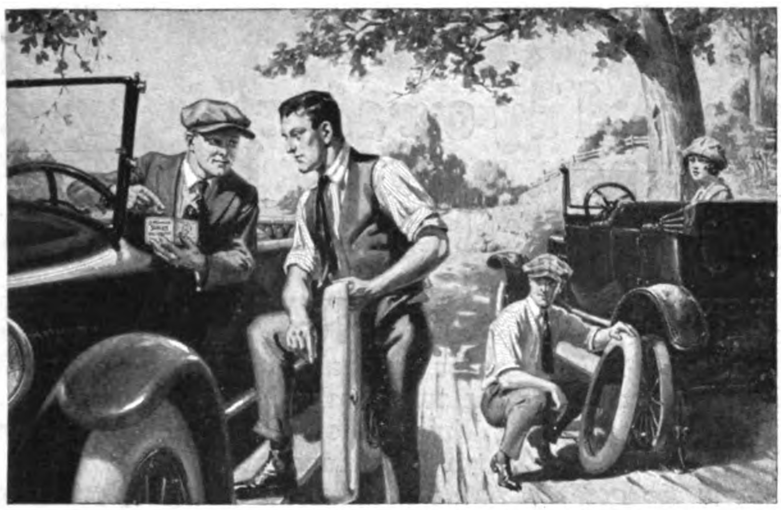

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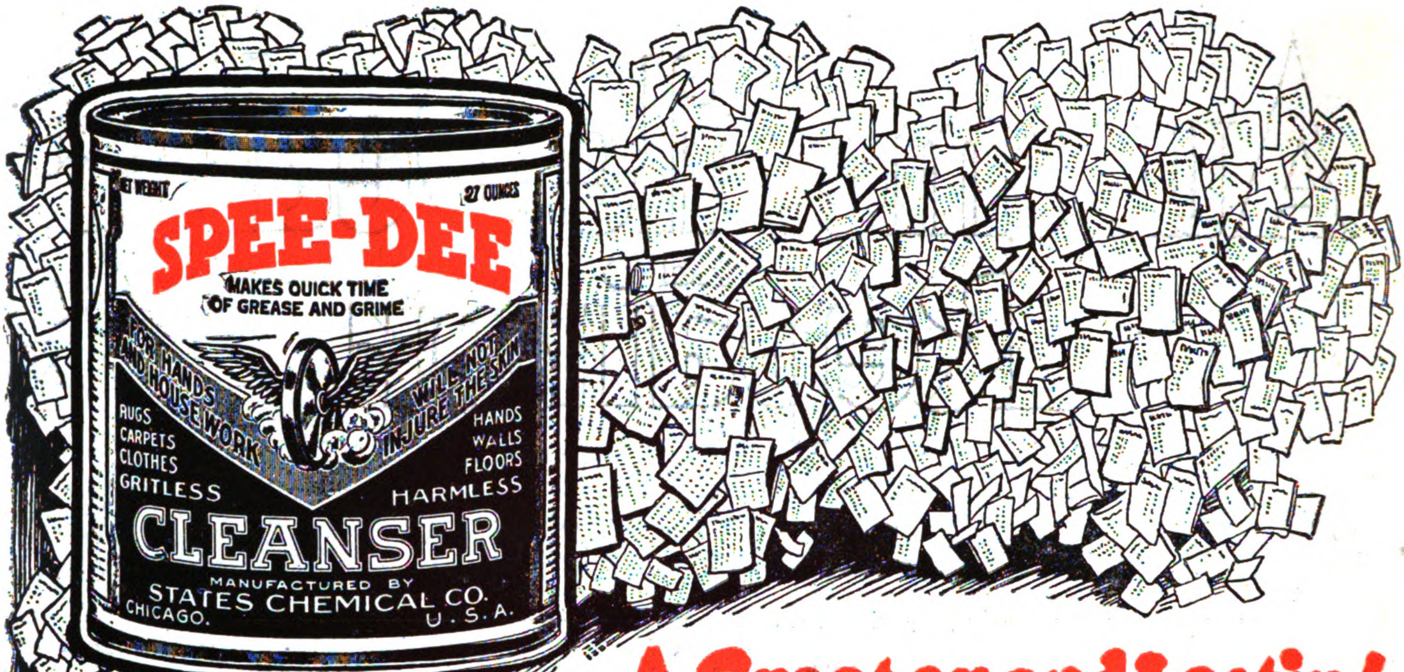

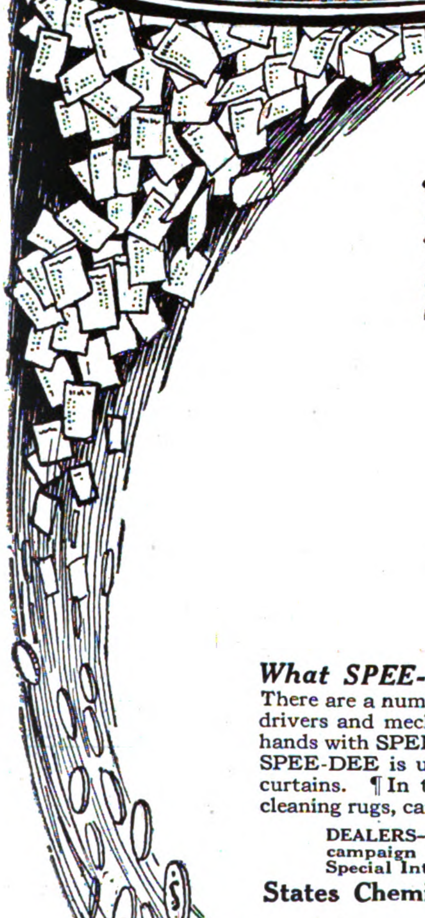

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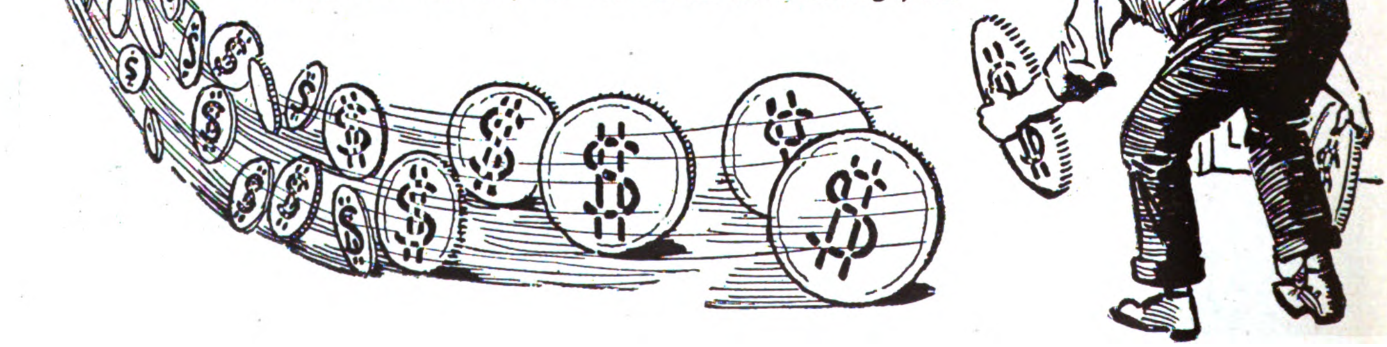

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The Curse in Salesmanship

Forcing Goods Down the Throat of an Unwilling Buyer is Poor Business

By the Editor

MANY of the readers will recall the old story of the Southern negro who took a position with a veterinary only to resign the next day. When asked the reason for his sudden dislike of the job he made a very satisfactory explanation.

It seems that the vet' had been called to doctor a colic case and Rastus had gone along so as to be handy in case of need. The doctor decided to administer the remedy via a long tube. He filled the tube with the colic medicine and told Rastus to blow and blow hard when he had persuaded the other end into the horse's mouth. But the unforeseen happened; the horse blew first and the unfortunate coon resigned.

Rastus knew enough to discard his job; perhaps it were better so, better for him and advantageous for the doctor who was the one to suffer the loss of the valuable drugs. But there are many salesmen in the country to-day who emulate the darkey. In making this statement I cast no reflections upon the customers inferred by the comparison.

Salesmanship as a Fine Art

The art of salesmanship is one which must be acquired and then mastered. We often meet men with such personalities that they could sell anything to anybody. Such men are a menace to humanity unless they can curb their selling ability.

A good salesman is not necessarily one who can sell goods, this may be a qualification but not an asset. The good salesman is the one who disposes of the goods and keeps the customer, and this statement widely differs from the last one made.

With a qualification, a salesman must be aggressive, he must make two sales blossom where but one grew before, but he must not force the goods down the throat of an unwilling customer. The good salesman's book, at the end of the day, may not show the *most* sales but that fact does not matter so much if all things are considered.

I think that in the above few statements I have crystallized all of the facts of good salesmanship as related to automobiles and accessories. Some of my statements may seem to conflict; it is possible that all of my readers may not agree with me, but I feel sure that my position can be substantiated.

Taken on the average, the automobile owner, or the prospective owner, is usually a fair business man. If he has had the brain and the ability to save money enough for an automobile he must have common sense. He may be entirely "green" insofar as automobiles and accessories are concerned and for that reason is innocent game for the skilled salesman.

Your salesman can make the "green" fellow buy a lot of stuff for his car and so overburden him all at once that he will never again trust them, or, on the other hand they can be careful and nurse him along for years. In the last analysis, the latter result is the more desirable.

Suppose, for instance, a man comes into your salesroom with the idea of investing in a few tire patches. One of your extra, special boys starts to work upon him and he buys a vulcanizer, two or three blow-out patches and perhaps a new tube in addition to his original desire. He does this under the spell of your salesman's silver chatter. He goes away and in a few hours begins to worry about the amount of money he has spent. Each extra thing forced down his throat is harder to swallow and within a few hours or days, perhaps, he feels angry at the imposition. He may vow never to go into your shop again and maybe he never does.

How much better it would have been if your salesman had used a bit of discretion and sold him just the patches and perhaps a vulcanizer, without forcing anything more down the man's throat.

Price Not Always Material

It is not always the amount of money involved which bothers the customer who has purchased too much under the charm of the salesman. He may have plenty of money to spare but after his friends have "jollied" him along about some foolish accessory which he did not need to purchase, he will have an everlasting distrust of the fellow who made him buy it, and then, of course, there are some people who cannot afford to buy even as much as they start out to purchase. Add to this the purchases which your salesmen charms them with and the custo-

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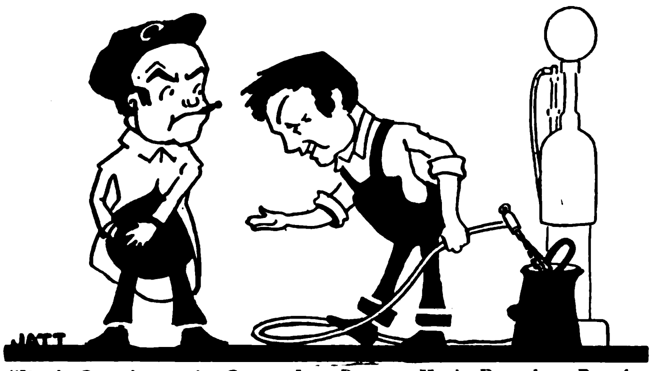
mers go away only after spending a good deal more than they can afford; they may not come into your shop again for months or, possibly, ever.

It is generally admitted that the new car owner is fair game for the accessory salesman and no one plays the game any more skillfully than the dealer who sells the



"Don't Overcharge the Owner Just Because He is Forced to Buy from You."

new car, (I refer to those automobile dealers who also sell accessories). This fact was brought home to me, forcibly, a short time ago when a new car was delivered to me by a small-town agent, and it was this man's aggression which suggested this article.

The car which I purchased was described by the manufacturers as being "fully equipped." You know what that means, a set of tools and a windshield with a motormeter thrown in. The dealer's first suggestion was that I let him fill the tank with gas and the engine with oil. This being entirely reasonable I allowed him to do so, but I noticed that he charged two cents more a gallon for gas and five cents more a quart for oil than was normally charged by other garages and filling stations in the vicinity.

Criticism number one. Don't overcharge the new car owner, just because he is forced to buy from you to get his car out of your garage, for if he notices this he will never come back.

Greasing 'Em Up

Having filled the tank and put oil in the engine, the dealer asked me if I wanted him to "grease 'em up." Having been a fairly consistent follower of the automobile game since 1904 the term of "reasing 'em up" didn't impress me as it might a new and green owner. For this reason I didn't say "yes" as the green owner is prone to do to save embarassment. I suggested to him that he had sold me the car ready to run and that I considered it essential that the grease cups be filled gratis. After an extended argument he yielded to my demand and filled the cups, most of which had been filled at the factory and didn't make the customary dollar charge as he did the other, and more green buyers.

Criticism number two. Don't try to sell the new car owner something he has already purchased and is entitled to have.

Since the State law requires a mirror as standard equipment he found no trouble in selling me that accessory. However he found a clever way of doing this little trick. He started in with an expensive, nickeled spot-light with mirror attachment and when he found that I happened to know that spot-lights were not allowed, he backed down gradually until he had sold me a cheap, but effective mirror.

Criticism number three. When you are absolutely sure of a sale don't try to unload the most expensive accessory without giving the customer an opportunity to choose between it and other similar but less expensive articles. Sell the product on its merits only, for if the customer can be convinced that he is paying for quality he is satisfied.

If the dealer hadn't tried the same trick in selling me a windshield wiper I would have purchased it but as before, he showed me the "only wiper in stock" first. Then later, happened to remember that he really did have a job lot of cheaper wipers. If he had originally given me my choice I would have taken the more expensive wiper but as it was I was somewhat sore anyway and didn't buy any.

And then the idiot tried to sell me a set of shock absorbers and a kit of tools. I call him an idiot because he had sold me the car with the statement that it was completely equipped and an easy riding machine without any shock absorbers.

And Who's the Liar?

In trying to sell me the shock absorbers and the tools he made the statement that, "Shock absorbers will add 100% to the riding qualities of the car . . . and you know the tools which come with the car are nothing but 'cheese.' "

Criticism number four. If you originally sold the car on its merits as a good car, don't destroy the illusion by

"The Good Salesman's Book, At the End of the Day May Not Show the Most Sales."

kicking about it when you come to make delivery. Granted that the tools are "cheese," is that any excuse for selling another set? What protection has the car owner against you; how does he know that this second set of tools which you are trying to sell is any better than the first set?

If you are selling a car which is "famed for its easy riding qualities," do you think it advisable to say to the same customer, a few weeks later that something is lacking to make it comfortable?

And as I drove off with the new car, the car of which I was presumably so proud, the dealer gave me his card

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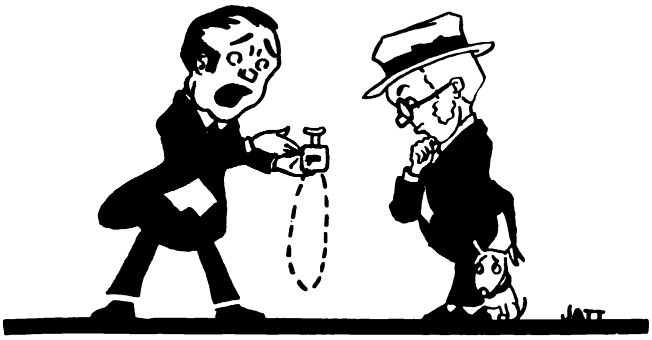
with the statement that he hoped to see me in a few months when I would need some new tires as that particular car was rather hard on tires! I can imagine the chill of discomfort which would travel down the aver-



"He Buys Under the Spell of Your Salesman's Silvery Chatter."

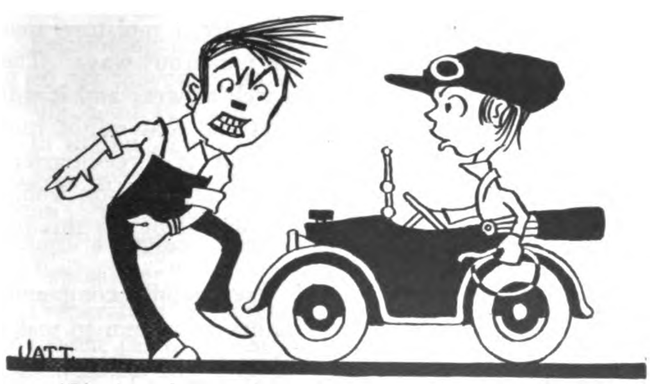
age owner's spine after getting such first hand information. Such things go far toward giving a new car an evil reputation.

Oftentimes, your salesman, in his endeavor to make a sale is prone to deviate from the truth to a great extent. To the green driver his statement may seem like a fact, but not so to the man who knows. And it doesn't pay to take the chance that the prospect is a green one. A statement which is a palpable lie ruins your chances for a sale.

Early last spring I drove a Hudson car into a garage to have the carbon removed. Before I had slipped out of the driver's seat one of those "peppy" salesmen was at my elbow trying to sell me something. The first thing he said excited my distrust for he wanted me to buy some sort of a radiator cleaning fluid.

In trying to make the sale he said that before the summer was finished I was going to have trouble with the car for the Hudson was prone to overheat due to the peculiar construction of its radiator and water jackets. He suggested that my only salvation was to buy this cleaning fluid and keep it handy in case of trouble.

Now as every reader, who knows anything about the Hudson car, is aware, there is not one chance in a billion that the engine will overheat under normal conditions. Because the engine does run so cool at all times the manufacturer has put on radiator shutters so that it may



"The Good Salesman Must be Agressive, But with Certain Qualifications."

be warmed to an operating temperature. The car may be driven on a hot day with the shutters half closed and still not overheat, or at least that is so with my car.

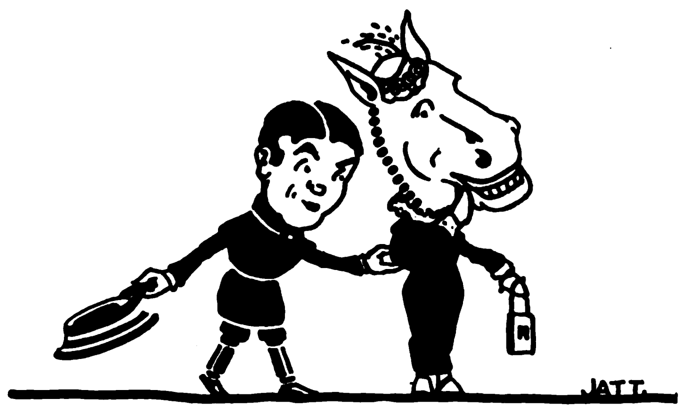
Despite this palpable fact, that salesman tried to sell me something that he knew, if he knew anything at all, was unnecessary. He only wasted his breath and gave me the impression that he didn't know his business. The impression was so bad that I checked over my accessories before leaving the garage to be sure that none had been lost.

There are certain combinations of things which should not be mentioned in the same breath, closely though they may be associated. For instance, if you carried flowers to a sick friend you wouldn't mention the fact that the blossoms were pretty enough to ornament a coffin.

And it is the same way with tubes and patches. After you have sold a man a nice new tube, told him that it would last until the car fell to pieces and the earth crumbled away, don't try to sell him a box of tire patches; don't try to turn his smile into tears.

Maybe the new shoe, which you sell a customer, will blow into shreds within the first ten miles, but if you are wise you won't advertise the fact by suggesting a blowout patch.

I recall an instance where a salesman was credited with selling more primers than any other salesman in the store. When asked how he made the record he stated that every time a man came in to complain about difficulty in starting he recommended a new carburetor and having



"The Good Salesman Can Usually Lead the Horse....But, then, Not All of Us are Horses."

sold the carburetor he would suggest a primer as being a necessary adjunct.

The record might have been satisfactory had it not been for the fact that this salesman's carburetor sales was far below the average. The answer to this was obvious. Having made the carburetor sale the salesman would spoil it by selling a primer and the customer would invariably decide to try the primer with his old carburetor and refuse to purchase the carburetor, or ask for his money back.

If you really wish to force a sale, if you feel that the customer will stand for it without being peeved, then endeavor to sell him an accessory entirely divorced from the one you have just sold. It is a psychological fact that a customer will be dissatisfied if he is forced to buy half a dozen things to supplement one which he has bought.

Sell accessories you must to stay in business, but there is a great difference between selling and forcing and this

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difference is not always in the price. There is a limit to the patience of the customer.

I can illustrate my point no clearer than by the following story with which I might as well close my article.

The man walked into the barber shop with a mop of hair two years old, almost, a beard of several weeks standing and so badly in need of sleep that he could hardly wait until he had plastered himself in the chair. For a number of weeks he had been out of a job and it had been a difficult choice to make between a hair cut and a good meal. He had finally decided in favor of the hair cut because he felt that such an investment might help him land a job.

Co-incident with his drop into the chair he dropped to sleep and the barber found a passive subject. Finishing the hair cut, the barber suggested a shave, tipping the chair gently backward as he spoke. The satisfied grunt of the victim was enough to start the knight of the razor on a new task.

As the barber lathered the victim's face he winked at the manicure and the boot black, both of whom immediately busied themselves with their respective tasks upon the sleeping patient.

With all the skill of the modern barber the white aproned man worked until he had expended quarts of hair lotions and facial creams and had cut and singed to the maximum.

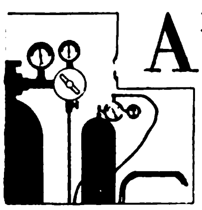
Finally, when he had spent all of his ingenuity and there remained nothing to be done except to collect his legal remuneration, he waked the customer.

The passive recipient of all these attentions opened his eyes and as soon as he had taken an inventory of his improved appearance was filled with dismay. He searched his pockets and pulled out the two-bit piece which he passed over to the barber. Settling cosily in the chair again he resigned himself to fate with the remark: "Sorry old man, a quarter is all I have, I guess you'll have to take back the shine, the manicure and the shave."

What Is In Your Car's Tires?

Guarding Against the Natural Enemies Such as Sunlight, Moisture and Frost

By Ellis H. Custer



AFTER Michael Tobin, repairman to automobiles, bicycles, dumbwaiters and sundry other things came back from his trip to the tire factory, he had more respect for the "shoe" that he hangs daily on a peg before the front door of his shop. He felt keenly that for an inarticulate thing, the ordinary automobile tire speaks volumes to those whom it serves. For an article that made no speeches itself it caused a lot to be made.

He knew, because he had taken part in many discussions, day and night, with tire fans. He had a sort of mental card index of his circle of fans, in which, opposite each name, he had registered how many thousands miles each claimed to have run either on his present set or on that superior tire that "once was, but never could be duplicated."

This morning he was primed because Doc. Narnsworth, the sewing machine agent, who came daily to his shop, got his letters there and used his telephone. Doc. knew all about tires. At any rate he claimed he did, because he had one on his car now that had turned more than 13,000 miles. Furthermore he had just laced an outside patch on it to try to obtain a few hundred miles more, instead of having it retreaded. Doc had decided with excellent wisdom that he never would have that tire retreaded. Tires were coming down, anyhow, from their sky-high war prices and he was not rushing into the expedient of retreading as he might have done a few months back.

Much as he boasted about the tire that had carried him nearly 14,000 miles, Doc. realized now that it would only be a matter of miles until he replaced it with a new one. He knew the walls of the old cover were weakening rapidly under direct sunrays met on the road and the moisture that collected and lodged in every tiny crack and crevice of the old carcass. In one of his speeches in the daily tire circle he had delivered himself thusly:

"Before you have a tire retreaded you must have the old carcass examined for any defects, as it is useless to cover up faults or to retread the fabric if the walls have perished or are partially disintegrated. Only experts can readily detect the weak spots caused by heat generations from within, from the direct rays of the sun slanted on them from without, or from moisture that gathers in the fabric and rots it in numerous ways. The life of a tire is limited by time as well as wear and it will not pay to retread a tire with material that might run, say, half as long again as it has run, if three-quarters of the life of the tire is spent. That is to say you would be wasting at least half of what you put on, in this instance.

Another essential is that the retreading compound must be good for 3000 to 4000 miles extra run to make the compensation requisite. It almost goes without saying that to retread a tire with low compound only means disappointment and discredit, and it is consequently not worth while."

Michael Tobin obtained the floor at this point. The circle of hearers grew larger as he proceeded with his

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description of what he had seen at the tire factory. A woman motorist came out of the tonneau of a car that had stopped outside to obtain gas and joined the listening group. A boy, holding in his hand a bicycle wheel to be respoked, was another of those who joined the circle from which none left until Tobin and Dr. Narnsworth had finished.

Starting the Tire

The primary operations in the making of a tire, according to the narrator, take place in the stores and compounding rooms. Here in orderly array are large supplies of the numerous products which enter into the composition of a tire—raw rubber of various grades,—which is the sap coagulated in the forests or on plantations into the transportable form of thin crepe, blanked crepe, sheet or block; drugs, such as sulphur and zinc oxide, cotton and other fibres; various oils and resins; pigments. One sees the rubber and other components being weighed out. The different weights taken of the different grade rubbers will affect the quality of the tires made with them and the quality will also be influenced by the amount and nature of the drugs, oils, resins, pigments and canvas to be used.

Following the duly weighed out components to the mill room one sees where the ingredients, by the medium of giant rolls, are transformed into dough. First the raw rubber is fed into the rolls which soften it, that is, to say, make it plastic, by the agencies of friction and heat. To the elastic mass the drugs and other ingredients are now added gradually and the mixture is rolled and rolled again until it is quite of a like body throughout the mass. This sheet of thoroughly mixed dough is cut through to free it from the mill, and is transferred to other machines for calendering or frictioning.

The Process of Calendering

Calendering is the process of rolling out the dough into sheets; the thickness of the sheets, which can be regulated by adjustment of the machine, depends on the use to which they are to be put; varying for instance, according to whether they are to be required for inner tubes or treads.

Frictioning is the operation whereby the dough is applied to canvas in such a way as to permeate it and combine the two into one material.

In the building up of tires two varieties of rubberized canvas are used; one consists of the material resulting from frictioning, the other the canvas to which the dough is applied in solution form by the process known as "spreading."

Preparatory to spreading, the dough is mixed with a solvent to form a soft paste. In the spreading room this paste is mechanically distributed over the surface of the canvas and the canvas then run over hot plates to dry the application and evaporate the solvent, for in any process it is essential to keep the drugs, canvas, etc., free from moisture.

Passing through the canvas department on the way to the next scene of manufacturing operations, the importance of the cotton to the rubber industry in the making of tires is very evident. Cotton for the making of tires is indispensable. For tire canvas it is essential that the cotton be of a long staple and a strong variety. Fine quality long cloth is used for the wrapping of inner tubes in preparation for the vulcanizing process.

A more ordinary quality cotton sheeting is used in the calendering machines to prevent any portion of the moist surface of a sheet of dough sticking to any other portion while the sheet is being rolled out, and during the time that it is put aside to dry.

Entering the building up room, numbers of men and women are seen carrying out the various details whereby the materials that were seen in the preparatory stages,

Michael Tobin's Tire Shop

are made to assume the form of a tire. The "spread" or "frictioned" canvas is cut on the bias into strips. Layer by layer these strips are built up into the body of a tire around a mandrel. The number of layers or piles depends on the size and kind of tire being made. When the set number has been reached, an outer band known as the "tread" is added. The treads are made of dough, as distinct from the carcasses of the tires which are built up of rubberized canvas, and they are placed in moulds of the necessary sizes, engraved with the maker's name and trade mark.

The built tire, still on the mandrel, is put in a mould, which is swung on chains into the vulcanizing furnace. After vulcanization, the tire is detached from the mandrel by the aid of levers and a little soft soap and water, and is put aside to cool. Finally it is trimmed, examined, and on passing inspection is sent on to market and eventually to road or track.

In another department inner tubes are made by a special process. The material for these comes from the calendering machines in sheets, rolled, as previously described, in canvas. It is cut into strips of the required width, each of which is rolled in a certain way round an aluminum mandrel, this time in the form of a hollow tube. The edges are joined up and each rubber covered mandrel is swathed with a wrapping of cotton longcloth. The mandrels thus prepared, are placed in a frame wherein they are transferred to the vulcanizer. After vulcanization, the longcloth wrapping is removed

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and the mandrels are separately slipped into a pneumatic metal tube, the inner tube is blown off inside out from the mandrel.

The ends of the tube are now treated by a buffing machine, which roughens their surface so that they will take the application of solution whereby the two ends are joined, and the length of tubing becomes a circle. Before the junction has been made the joints are treated with cold cure, which vulcanizes the joints by the aid of a sulphur chloride solution.

"Yes," Dr. Narnsworth said, as soon as Tobin concluded his observations on what he had seen at the tire factory, "the best tire fabrics are made of long staple or long fibre cotton, by which is generally understood a fibre of not less than 1⅛ inches in length. Roughly one pound of cotton is required for every 3 pounds of rubber used.

"While the automobilist has probably considered the relative merits of the mechanical features of his machine, up to now he has mostly taken his tires for granted. Until recently he has not been equipped to consider the relative merits of the elements entering into the construction of his tire."

Tires are Not Pure Rubber

The speaker then proceeded to give further information to the effect that "it is fairly well known that 'rubber' in a tire is not pure rubber. Many motorists still think addition of mineral and other substances constitute adulteration. Nothing of the sort. The fact is that the tire contains not one but a number of qualities and compounds, and the art of using them, although brought to a high degree of perfection, is not widely appreciated. Ordinarily pure rubber, the mix of rubber and sulphur only, is soft, cuts easily and is useless for building of a tread.

"The ordinary fabric tire generally contains at least five grades of rubber:

1. the compound employed for spreading or frictioning the canvas.
2. the casing rubber
3. the intermediate compound
4. the tread mix
5. the special rubber.

"While all these must vary in composition according to each special use, they must be adjusted so as to contain no elements that resist mixing and be so that they may vulcanize to the same degree in the same time.

"The 'spreading' or 'friction' rubber must be soft so it may be readily forced into or around the fibres of the fabric; the casing must be a high grade mix capable of withstanding constant and considerable flexion, atmospheric influences and heat: Casing rubbers must be very elastic and yielding and are required to insulate one ply from another and to insulate even one thread from adjacent threads. They must also protect the casing from damp or dirt, whether from the outside inwards or the inside outwards.

"The mixings used in the casing for insulation purposes are perhaps the most vitally important, as they affect very materially the life of the tire as a pressure-containing vessel. The intermediate, again, compared with the tread, must be distinctly soft and partake of the character of a shock absorber; the tread mix must be tough and not subject to influences such as abrasion, cutting, and torsional effects.

The Tread of Great Importance

"In tires the first item for consideration is the tread, since tire failures primarily result from weaknesses in the tread's construction, or the elements entering into its construction. In simplest form the tread is essentially a rubber sheathing made to resist wear, strengthened by a reinforcement of fabric or cord. Since crude rubber has few of the qualities that would fit it for service requirements, the tiremaker must compound it with drugs, which make it more suitable for use.

"Long experience has proved that zinc oxide is an essential filler, because it imparts the physical property necessary to make rubber adaptable to tire use. Now the reasons why these properties may be maintained under long service conditions are these: First it increases the tensile strength, thus making possible the high air pressures which are carried; second, it increases its resistance to abrasion, permitting long use with minimum wear; third, it increases the toughness, eliminating the cracking which results from mud, stones and other causes; fourth, it prevents the rubber from cracking and splitting due to aging, and fifth, under service conditions, the mixture of zinc oxide with rubber does not heat up to a point where the mixture loses its strength, abrasion resisting properties and toughness.

"When long life is considered, the last two points are of vital importance. Other fillers are used to some extent. Some are good, but probably none equal zinc oxide. Some heat rubber under service and it is known that after rubber once is heated above a certain point, it does not recuperate and regain its former properties. When rubber deteriorates it loses toughness, becomes brittle, its abrasive resistance is lowered and its tensile strength is rapidly reduced.

The Four Qualifications of a Tire

"There are four demands of prime importance made by users and consumers of tires, 1—abnormal resiliency, 2—abnormal mileage, 3—abnormal strength, 4—abnormal speed. Tires are built to carry loads with quite narrow margins. It is almost a criminal offense to attempt the strain of an overload, which is not as it should be. In all types of tires of present day design the rubber is strained and stretched, authorities say, under the driving and braking strain. The ideal tires would always, when in sound contact, be under compression and never under stretch. Under a condition of compression only, instead of stretch, the user would obtain better load capacity, longer mileage and enhanced speed.

"The improvement tendency is toward flexibility of the

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tread, thus enabling the load to be easily carried, for instead of the tire carrying on a square inch of rubber more than a square inch of rubber is capable of carrying, what actually happens where a pyramidal spread of tread is secured is that the tires under load will increase their tractive contact in the direction of motion by, perhaps, five times, and under excessive overload the tires can increase their contact across the wheel very nearly four times in some of the newer types of heavy pneumatics on the market.

"More black rubber treads are being offered by domestic makers. These are secured by use of carbon black or gas black, or an incomplete combustion of natural gas rich in hydrocarbon, forming a compound from which a toughening of the tread dough ensues.

"The material used in the 'cord' of most tired of which we hear is substantially a fabric which is all warp and no weft; in effect it consists of well-spaced, stout warp threads, or cords, held together at wide intervals by the flimsiest of weft threads. Thus it has strength in one direction only, but this drawback is overcome by crossing alternate layers.

"The advantage of the 'cord' is that the wide spacing makes it an easy matter to fully surround each thread or cord with a layer of rubber, and so entirely counteract or avoid the friction between warp and weft which is, presumably, the most destructive agency at work in a fabric tire. There is this matter of structural rubbings and strains to be considered in addition to the enemies of tires existing in nature, namely, sunlight, moisture and frost."

After the last bit of information was given the little circle broke up. Doc. Narnsworth went out on his own round.

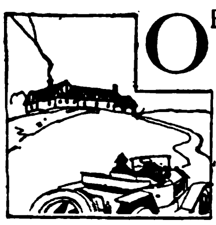
Michael Tobin, feeling that he had brought out enough for one day about tires, attacked the job of respoking a bicycle wheel for the youngster who had been listening while he waited.

"There's not much going on in the dumbwaiter repairing just now," Tobin said. "That's more of a Wintertime job. I have all I can do right now with tires and bicycles. What's in your tires, Mister? Rubber, textiles or—just miles?"

Removing Carbon by Burning

The Use of Oxygen and Fire for Removing Carbon from the Automobile Engine

By David Baxter



OF all methods of removing the carbon deposits from automotive engines, that known as carbon burning is probably the simplest and quickest, and on account of this it is no doubt the best if properly executed. Despite this there are those, who, for various reasons do not want to recommend the process, and say carbon burning is injurious to the valves and pistons.

But if the mechanic attends to a few essentials precautions and is careful what he is doing, there is no danger of setting the car on fire or warping the valves and pistons. The chief precautions are to see that the gasoline supply is cut off and that the valves are closed before igniting the carbon; also that the carburetor and oily parts of the engine are covered with asbestos paper. If the carbon deposit is heavy there is often quite a pyrotechnic display. But this is not necessarily dangerous even where the gasoline tank is located over the dash, provided the mechanic will isolate it properly; by placing a sheet or pad of asbestos paper between the tank and engine.

The only extra equipment required for carbon burning is a tank of oxygen, a regulator valve and a torch. As many garages nowadays have a welding plant in connection with their other repair departments the carbon burning outfit is really not an additional equipment; the welder already has everything but the carbon burning torch; most welders have that too. In fact, the gas welder is the logical one to do this class of work, due to his knowledge of the oxygen apparatus.

In any event it may be well to impress upon the mechanic, especially the beginner in the carbon burning art, that he is to use oxygen only. That is if he is employing the welding plant for the work. Otherwise he will presumably have nothing but the oxygen at hand and therefore will be in no danger of using the other welding element, acetylene.

Some welders even go to the extreme and use a regulation welding torch fitted with a special carbon burning tip. This is really hazardous as there is always danger of turning on the acetylene accidentally. To be safe this welder should take the acetylene hose entirely off the torch; then he will not accidentally turn on the acetylene pressure. Nor will he be tempted to use it to start the combustion.

Oxygen alone will not burn but without it nothing will burn. Increasing the oxygen increases the combustion. That is what the carbon burning process is in reality: a high rate of combustion. The carbon deposit is the fuel and the oxygen maintains the combustion.

However, when removing the carbon from an automobile engine the oxygen should not be under high pressure; and it should be constant. For this reason a regulator or reducing valve should be interposed between the

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torch and the tank of oxygen. Then the pressure can be accurately gauged; a valve such as is used in welding is no doubt the best.

If the oxygen pressure is too low the carbon will not burn well since the supply is not sufficient to keep the combustion continuous, and if the pressure is too high it will blow the fire out or overheat the chamber.

A Carbon—Burning Torch Has But One Hose

In few words, the carbon process consists of dropping a lighted match into the spark plug hole, or a bit of burning waste will do, and bringing the jet of oxygen in contact with it. Then as fast as the carbon burns the oxygen is supplied. The carbon literally consumes itself. The tip of the oxygen jet follows the burning, usually in circles around the cylinder and piston's head.

To prevent the flying sparks from endangering the car, the operator should take the precautions suggested above. That is he should be careful of the gasoline supply and protect the greasy parts of the engine with sheets of asbestos paper as shown in the photographs accompanying this discussion.

Protect the Carburetor

The carburetor especially should be guarded. Also it is well to be careful where the carbon burning is done. It should not be executed in a crowded space or where trash, greasy waste or other combustibles are piled. Perhaps it is not necessary to warn against doing the carbon removing near oil, gasoline tanks or barrels. Some good chemical fire extinguishers are not out of place near where the carbon burning is done. Instances are recorded where the car was burned on account of carelessness and the absence of proper facilities.

After these precautions are attended the engine is started, or permitted to run, until it stops of its own accord; first cutting off the gasoline supply at the tank. Being sure the engine consumes all of the gas in the carburetor and tank pipes. The vacuum feed is entirely drained, too. The engine is then ready for the burning process.

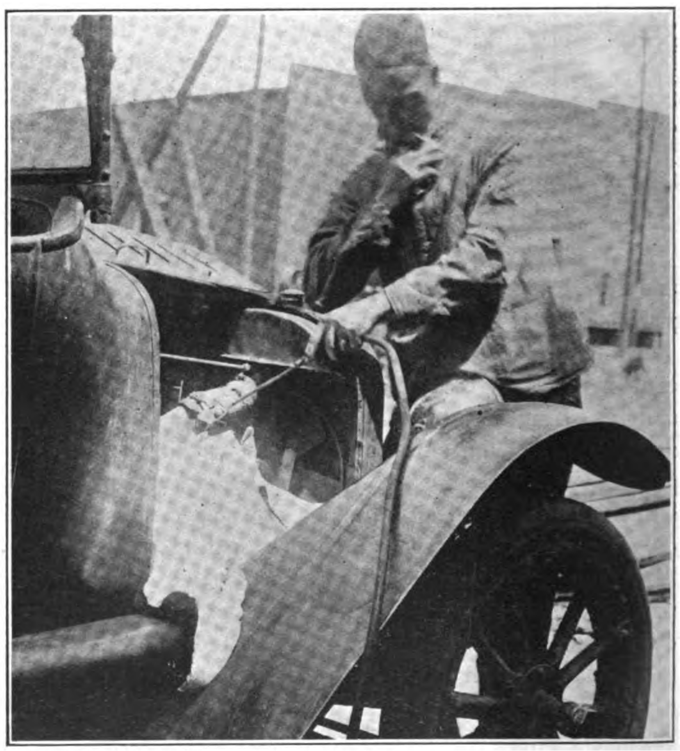
The spark plug is taken out of the first cylinder. If the carbon is dry and hard it is an indication that the carbon in the chambers will not burn freely but should first be moistened with kerosene or alcohol. Only a very small quantity should be employed, however. Just a drop or two squirted on the walls of the chamber; sufficient to start the combustion.

Keep Oxygen Pressure Normal

It does no good to increase the oxygen pressure when the carbon is too dry to burn well. Nor is it a good idea to inject too much kerosene as this will tend to raise temperature on the combustion, which might warp the metal in the casting; one of the acts of carelessness or ignorance hinted at in the beginning of this article.

If the carbon deposit on the spark plugs is moist the operator is practically assured of a continuous combustion so he should not inject additional oil through the plug hole. The condition of the plug is a good indicator of the interior.

After draining the engine, placing the spark plug guards and removing the first plug, the next step is to adjust the regulator valve; first attaching the carbon torch hose to the regulator if this is not already in place.



Look Out for a Display of Fireworks; For at Times the Sparks Fly Fast

The regulator thumb screw is turned to the right until the pressure gauge registers about ten to twelve pounds; not over fifteen pounds.

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Then the engine is "turned over" until the first piston, the one under the open plug hole, comes up to the compression position. In other words crank the engine until the first cylinder to be operated upon is on compression; until the piston is at the top of the stroke and the valve is closed. It should be made certain that the valve is closed as it is only the open or partially open valve that may get damaged by the burning process. The carbon burning should not be started until the operator knows the valve is tightly seated.

Lighting the Oxygen

The long copper nozzle or tube of the carbon torch is then inserted in the spark plug hole. Then a lighted match or blazing particle of oiled waste is dropped into the spark plug hole and the oxygen is turned on.

As soon as the oxygen strikes the blazing match the sparks commence to fly, accompanied by a loud roaring noise. Sometimes a sheet of flame is blown out of the hole. The tip of the torch tube is briskly moved around in the chamber, following the course of the burning as much as possible.

Sometimes it is necessary to drop several lighters into the cavity during the burning process in order to be sure all of the carbon is removed or to keep it burning. Usually, however, all of the deposit is removed in one stretch. When it will no longer ignite it is safe to assume that all of the deposit is burned and the piston top, chamber, and valve should be bright and clean.

The next thing is to use an air hose or hand bellows to blow out all grit or other substance that may be remaining after the carbon is burned. Road dust or silica is sometimes found in the cylinders; the oxygen process will have no effect on this or other non-combustible that may have been drawn into the cylinder. All such substances must be blown out after the burning is finished.

Then the valve, seat and piston top are swabbed with clean kerosene, and the spark plug is replaced to prevent the intrusion or more dirt when the next cylinder is treated. After this the engine is cranked in preparation for the next cylinder cleaning.

The second piston is moved upward to bring it on compression the same as the first one, after the second spark plug has been taken out. The burning process is repeated on this cylinder the same as on the first; without disturbing the asbestos paper protectors.

Then all of the other cylinders are treated practically the same as the first, one after another; the spark plug of one being replaced before attacking another.

The operator soon learns to tell when things are going right. He learns with practice to know when the pressure is too low or too high. If considerable flame issues with the sparks he will decrease the oxygen pressure.

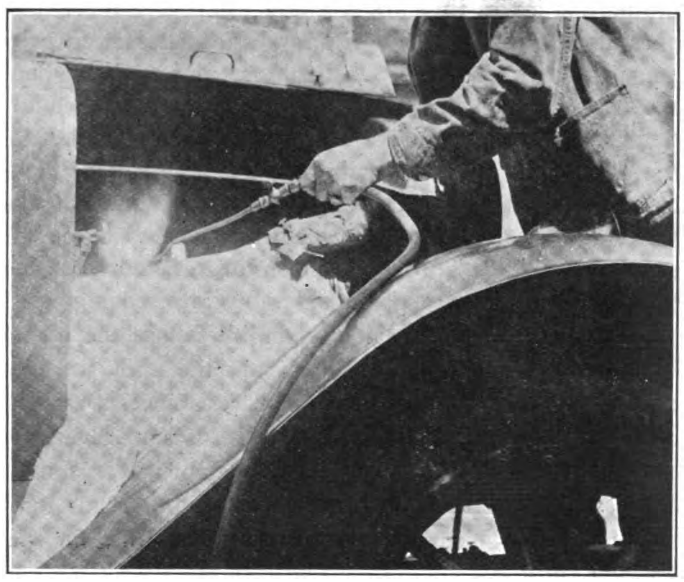
Now in conclusion it should be said that it is no doubt best to purchase a carbon torch made especially for the purpose of removing carbon deposits from automotive engine cylinders. But an ingenious mechanic can easily construct a torch that will answer to all intents and purposes.

First, a section of soft copper tubing twelve or fifteen inches long is obtained. One end of this is brazed or soldered to a small globe valve, or needle valve. This tubing should have an inside diameter of approximately a sixteenth of an inch. The other end is pinched slightly together to make a smaller outlet, so as to permit the concentration of the oxygen to a fine stream.

The other side of the valve is arranged for attaching the oxygen hose. The soft copper may be bent to any desired shape to reach all sections of the carbon deposits. However, this arrangement is not always leak-proof so the operator should always shut the oxygen tank valve when through using the home made torch. The heavy pressure of the tank will cause even a small leakage to waste considerable gas in a short time.

Now a few words on the subject in general: The oxygen tank valve should not be opened until ready to do the burning. Nor should the torch valve be opened before inserting the copper tube into the spark plug hole. There is too much chance of leakage and waste of oxygen which escapes rapidly on account of the high pressure of the "loaded" tank. The oxygen tank for welding purposes has a total pressure of 1800 pounds when full.

And the torch valve should be closed before withdrawing the tube from the spark plug hole; the tank valve should be closed the moment the job is completed.



Note the Blaze Issuing From the Spark-Plug Hole; Also the Asbestos Paper To Protect the Oily Parts.

There is another side to the thing besides economy, too. The jet of oxygen is liable to come in contact with a spark on the operator's clothing and cause him to get a severe burn.

The chief advantage of this process is that it does not require the dismantling of any parts of the engine except the spark plugs. Of course the car owner can remove the head of some engines cylinder blocks and scrape off the carbon, but if he is not very careful he will scratch or otherwise mar the surface of the iron, thus leaving it open to an easier depositing of the carbon. The oxygen process leaves the surface as smooth as a new casting.

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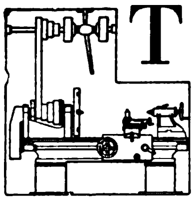
Automobile Storage Batteries

The Second of a Series of Articles Dealing With Primary and Secondary Batteries

By Sidney F. Walker, R. R. N.



THE exciting liquid, the "electrolyte," as it is called, the troublesome part of the dry cell. With the wet cell, experience shows that the larger the volume of the liquid, the better the cell works; the liquid dissolves the resultant salts and keeps them in solution, and so the battery maintains its strength, and the zinc rod keeps very clean. In the dry battery, in place of a liquid, a paste has to be employed, carrying a certain quantity of liquid, also a certain quantity of sal-ammoniac solution; it also contains in modern dry cells other chemical salts that by combination provide the liquid that is required to keep the cell going.

There is another very peculiar feature about liquids through which electric currents are flowing. They carry the liquid in the direction in which they are moving; thus in the LeClanchè battery the flow of current from the zinc rod to the carbon plate carries the liquid through the porous jar to the carbon plate. This is a most important feature in all batteries, and in particular in primary batteries where porous diaphragms are used. When the batteries are first set up, the internal resistance of the cells is high, because there is very little liquid inside the porous cylinder; when the battery has worked for a certain time, the liquid is carried right to the carbon plate, and all over the mixture of carbon and oxide of manganese in the porous cell, and the resistance to the passage of the current is considerably lowered.

When the secondary salts crystallize out in the pores of the porous pot, and fill them up, the path for the current is considerably reduced, the resistance is raised, and later on the cell breaks down, refuses to give any current; and when examined the porous pot will be found to be very hard indeed, while when it is first put into service it is sufficiently soft to be scraped with a file, or a sharp knife.

The Dry Cell

In the dry cell the porous pot, and the outer containing jar are done away with; the zinc takes the form of a plate which is rolled into a cylinder, fitted with a bottom of zinc, and forms the containing vessel. The carbon plate, the crushed carbon, and the oxide of maganese are formed into one unit, block; the carbon and the oxide of manganese are crushed to a fine powder, and pressed on to the carbon plate, which usually takes the form of a cylindrical rod, by hydraulic pressure.

As readers know, for many years, very small dry batteries have been on the market for flash lamps. These batteries are built on lines of the larger dry cells described above, and the added chemicals enable them to furnish what we should have considered a large current for the large wet battery before the development of the modern dry cell. The dry cell has to meet the competition of the storage battery, even for small flash lamps; a short while ago the writer had a storage battery through his hands, especially designed for flash lamps; he used the battery in an electric torch, and it stood very well indeed.

One Disadvantage of The Dry Cell

The dry cell has one very important disadvantage, as both the wet kind of cell, and the storage battery; when it runs down it can only be thrown away. Wet LeClanchè cells willl work for years if they receive the necessary attention, and the necessary feeding. Some years back, the present writer had charge of a large number of wet LeClanchè cells, working electric signals in British coal mines; the batteries were worked very hard, but they used really very little material, and lasted the whole of the years his contract extended. He had to attend to the batteries himself, because the contract price obtainable would not allow of paying a man to do the work, but he made a very good thing out of it. Similarly storage batteries will last for years, for very long periods indeed, if they are properly designed for their work, carefully looked after and recharged when required.

With the dry battery, when a cell, or a group of cells such as those put up for flash lamps, runs down, there is nothing for it but to throw them away. With the price of the flash lamp dry batteries before the war, and even at the present time, it is more economical in many cases to use the dry cells and throw them away when exhausted than to use either wet LeClanchè cells, or storage cells. The present writer has used a little flash lamp battery for his housebells for some time past; the battery of wet cells that had been in use previously gave out, and as an experiment, be fitted up a little flash lamp battery costing less than a filled porous pot of a wet cell; the battery did not last as long as a wet cell would have if properly attended to, but it has saved an immense amount of trouble to just disconnect the flash lamp battery that has run down and put another one in its place; also the expense the writer believes is not much more.

There are two principal kinds of storage battery on the market, the lead-sulphuric acid cell, and the nickel-iron alkali battery; the lead battery has been on the market nearly 40 years, the nickel-iron battery which was worked out by Mr. Edison has been on the market about 20

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years; both are very much alive, both have their good points, which will be described in the following.

The lead battery is based upon the discovery of a French physicist, M. Gaston Plantè, over 40 years ago; he found that when two lead plates were immersed in a dilute solution of sulphuric acid, and a current of electricity was passed through the cell, so formed, for a certain time; if the connection with the current was broken, the lead would now furnish a current for a short time, in the opposite direction to that of the current that had been made to flow through it. Plantè found that by repeatedly charging and discharging his lead cell, he gradually obtained a larger and larger proportion of the current and time expended upon it; also he found that a high oxide of lead was gradually formed upon one of the plates, the anode, the plate where the current entered, and that if he could arrange for the formation of a mass of spongy lead on the other plate, the secondary current obtainable from the cell was increased in proportion to the volumes, or weights of the oxide of lead, and the spongy lead.

The First Storage Battery

A good many years later, another French physicist, M. Faure, hit upon the plan of placing a certain quantity of two oxides of lead on the two plates, or multiples of two plates in a cell, holding the oxides there mechanically, and submitting the cell so formed to a charging current of electricity, in the same manner as Plantè had employed with his plain lead plates. The oxides were held in position in the early cells by porous diaphragms, by skins, or something of that kind, anything that would keep the oxide on the one plate from dropping to the bottom of the cell, or from finding its way to the other plate. The oxide that was pasted on the anode where the current entered when the cell was being charged was a high oxide, and that on the other plate was a low oxide; pasting was the method employed, the diaphragms or wrappings preventing the paste more or less from getting away.

It should be mentioned that lead combines with oxygen to form several different oxides, several different substances, and it is this property that has enabled the lead cell to attain its present value. The high oxide that is placed upon the anode is not the highest oxide that lead can form; when a current flows through a cell, entering at the anode, the high oxide takes up some further atoms of oxygen, and forms a still higher oxide, the highest the lead is capable of forming. The office of the low oxide which is pasted on the cathode, the plate at which the charging current leaves the cell, is to be reduced to pure lead, spongy lead.

Another explanation should be given here; when any two dissimilar metals are immersed in a liquid, an electrical pressure is set up between them, so that if a circuit is formed by means of a wire, or in any other way, between the metals outside the liquid, a current will flow from one of the metals to the other outside of the liquid, and from one of the metals to the other inside of the liquid.

It will be remembered that in the LeClanchè cell, and the dry cell, the current flows from the zinc to the carbon through the liquid inside the cell, and back from the carbon to the zinc when the circuit is completed, outside the cell. The point the writer wishes to make here is, the pressure that is created between two metals immersed in a liquid, varies with the metals, and with the liquid. The law quoted above should really be stated; when any *two substances* are immersed in a liquid, a pressure is set up between the two substances, and a current will flow through the liquid from one substance to the other, and back to the first substance through a conductor outside the liquid. With the large majority of substances, and the large majority of liquids practically no pressure is set up, no useful pressure; but pressures are set up between gases and metals or carbon, as in the case of the LeClanchè cell, the back pressure at the carbon plate; also pressures are set up between other substances immersed in other liquids. The highest pressure set up between any two substances immersed in a liquid is that between the high oxide of lead mentioned above and spongy lead immersed in sulphuric acid; it is in the neighborhood of 2 volts; when the cell is being charged, as will be explained it may rise as high as 2¾ volts per cell, and during discharge may fall as low as 1.5 per cell; it is usual not to allow it to fall below 1.8, in some cases 1.85 per cell.

It will be understood from what has been said above, that the passage of an electric current through a cell arranged as above described, with a high oxide of lead on one plate, and a low oxide of lead on another, produces the conditions for a galvanic cell of the highest pressure known; the working pressure is always taken as 2 volts per cell; the pressure of LeClanchè and dry cells is 1½ volts per cell; that of some special forms of battery in which nitric and sulphuric acids are employed is also in the neighborhood of 2 volts per cell, but these cells are only employed for experimental work. The practical working pressure of the Edison cell is taken as 1.2 volts.

Modern Lead Battery Plates

As will easily be understood, the arrangement of pasting the oxide of lead on the lead plates, made by M Faurè, while it was hailed by Lord Kelvin and others as a very great advance was really hardly a practical one; the battery required to be nursed very carefully, or the plates were quickly stripped. It was not long before several methods were introduced for holding the oxides upon, or rather in the lead plates. The methods of accomplishing this are very various; the writer will describe the principal ones in fairly full detail in the course of the article.

It should be understood that the office of the lead plate has been entirely changed since Plantè's early experiment; the lead plates are now only carriers of the oxides, and electrodes designed to receive the current during the charging period, and to pass it on to the oxides, and again to receive the current from the oxides during the discharging period and to hand it on to the outer circuit.

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The Charging Period

During the charging period the charging current is received by the lead grid, as the modern form may be described, an dit passes it on to the high oxide embedded in different parts of it by conduction, just as a cable for instance passes on a current to a brass terminal leading to the wires of some apparatus that is to use the current, also by conduction. If anything is interposed between the lead grid and the lead oxide; if a portion of the lead oxide is screened from the lead grid, to that extent the current does not pass from the grid to the oxide, and so the formation of the higher exide at the point, or over the area where the screening is present, does not take place.

At the cathode, during the charging period, the current passes from the oxide to the lead grid, and again if there is any screening by any foreign substance, the current cannot pass through the screened area, and consequently the reduction of the oxide to pure lead cannot take place over that area.

During discharge, the current passes from the lead grid of the cathode to the spongy lead, and thence into the liquid, the dilute sulphuric acid; in passing, the current causes the spongy lead to oxidize to the low oxide from which it was formed during the charging period. At the anode, during the discharging period, the current flows from the high oxide to the lead grid, and in so doing reduces the high oxide to the lower oxide from which it was originally formed; and again if any substance is interposed between the oxide and the lead grid, of a high resistance, the current cannot pass through the screened portion, and the reduction of the oxide cannot take place.

The Passage of The Current Through The Oxide

There is an important point here which, the writer believes, has led to a great deal of trouble in the handling of storage batteries; the oxide, both the high and low oxide, and the substances into which they are formed by the passage of the current to them, must be porous, and their pores must carry some of the liquid electrolyte. If either of the oxides, or the spongy lead, is not porous, or if any part of either of substances forming what are called the active materials that cause the electrical pressure to be set up, is not porous, the current cannot flow through that portion and consequently that portion is thrown out of action; and the useful current the battery will furnish on discharge, also the useful current it can take up during charge, is reduced. This means that a larger battery is required to do the work, whatever it may be, than would be necessary if the substances were in their proper condition.

It should be mentioned here that within any galvanic battery, whether it is a primary battery, or storage battery, the current is connected by the liquid from one electrode to the other. In the case of the primary battery, the zinc rod or zinc cylinder, and the carbon rod or plates are the electrodes, and the current is conducted from the zinc to the carbon entirely by the liquid that is present, and it follows that the work the battery will do, the current it will furnish depends upon the liquid that is present, and upon the closeness with which the liquid washes, so to speak, the two electrodes, the closeness of the contact it makes with them. If there is a layer of oxide of zinc on the rod or cylinder, as there usually is, an electrical resistance will be set up to the passage of the current from the zinc rod forward.

Some of the early primary batteries that were enabled to furnish what were considered large currents in those days, and for a comparatively long period as it was understood in those days, owed their success almost entirely to the presence of a large quantity of liquid that dissolved the zinc oxide and chloride as they were formed, and so left the zinc rod clean. The oxides and chlorides formed on the zinc plate are themselves porous, and even when there is a coating of these salts on the zinc, a certain amount of current does get through, but if the coating is allowed to increase very much, the electrical resistance gradually increases, and it may finally break the cell down.

In the storage battery there is a certain quantity of liquid present, dilute sulphuric acid in the lead battery, and a solution of caustic potash in the Edison battery, the plates carrying the active materials being immersed in the liquid; but it is absolutely necessary that the liquid should find its way right through the active material, the oxides of lead and the other substances employed in the Edison battery, right up to the lead grid, or the steel carrier. Unless the liquid is actually in contact with the carrier metal electrodes, there is no conducting path from one electrode to the other, and whenever, from neglect, from not recharging when required, the liquid which ought to occupy the pores of the active material is allowed to be displaced by a solid substance, the working of the battery is interfered with, the current it will furnish on discharge, and will take up on charge, is lessened; and this means that a battery of a given size will not do the work it was designed for.

PAGE THE FIRING SQUAD

"Yes, sir," said the needy inventor, "I need money, my back is to the wall."

"Well," remarked the business man hopefully, "sunrise isn't so far away."—*American Legion Weekly.*

HE: Are you married?
SHE: That's my business.
HE: How's business?
—*Pennsylvania Punch Bowl.*

"Pa, what is a joke?"

"Shet up! Don't you know any more than to criticize the government?"—*Penn State Froth.*

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The Ford Steering Gear

Taking the Wobble and Play Out of the Front End of the Flivver Is Not Hard

By Glen F. Stillwell

PROPER adjustment of the front end of the Ford is of vital importance. Steering systems that have been given negligent attention cause nearly as many accidents as reckless driving.

In cars other than the Ford, the two front springs hold the axle in the right pitch to prevent its cramping over center. On the Ford the radius rod takes care of this, but not infrequently it becomes bent, or loose at the ball, and if not attended to will result in damaged fenders, headlamps, radiators, or even worse.

As simple as the steering arrangement is, the number of owners, and mechanics whose knowledge of it is limited, is surprising. Few of them know that an axle pitched out too far beneath will cause the steering wheel to shake a mean shimmie, that is, when driving slowly, even on fairly smooth pavement, the wheel will start to work rapidly back, and forth, and even gripping it firmly with both hands will not stop the motion.

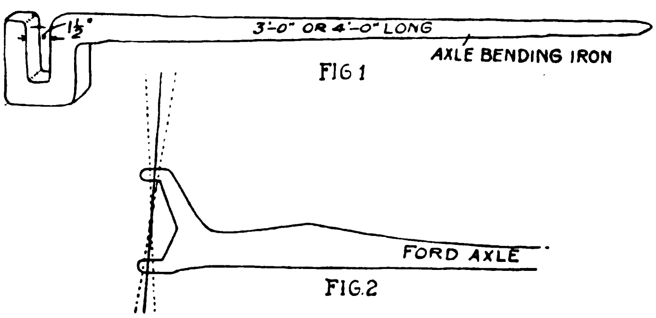

FIG 1
FIG. 2

The driver's only recourse is to come to a full stop, get into low, and start all over again. This is aggravating, not to say humiliating. Hours have been spent in overhauling the front end when a few minutes work with axle bending iron would have turned the trick. Most of us know that when the axle is pitched under on the bottom side, it will cause the wheel to cramp when rounding a corner. This is remedied with axle bending iron, or by tightening the studs that fasten the ball end of the radius rod to the bottom of the crankcase.

Figure 1 shows axle straightening iron, Figure 2 shows correct pitch of the axle.

If the bushings are worn throughout, it is advisable to give the front end an overhauling. The front end is jacked up, the wheels removed, then the spindle arm bolts, and the spindle body bolts. Quite frequently it will be found that these last named will be so corroded in the spindle body, or axle that removal is difficult. If this is the case the heat of a blow torch applied where needed will facilitate the removal. If the spindle bolt turns in the axle apply heat to spindle body, if it turns in the spindle apply heat to axle, but do not heat the holt.

Do not exercise too much force on the wrench, for you are apt to shear off the bolt. If this is your misfortune, saw the bolt inside the top, and bottom of the axle. The spindle can then be removed, and the remainder of the bolt drilled out of the axle, for nine times out of ten it corrodes in the bottom fork of the latter. If a portion of the bolt remains in the upper fork, it may be easily removed with a wrench.

If part of the bolt stays in the bottom of the axle, saw it off (no, not the axle, the bolt) flush, and center punch it on the bottom. Then jack up the front end high enough to permit the use of a portable power, or breast drill, as shown in figure 1, 4. The drill is held in a vertical position, and fed by gradually lowering the front end.

A ⅜, or slightly larger bit is used, and after it is run through the remainder of the bolt is removed with a cape chisel, or similar tool.

If the bolt is corroded in the spindle body it may be driven out from one end or the other (try both) and usually one of the bushings will come with it.

Removing the bushings is a job most mechanics dread, but the operation is made easy by using the device shown in figure 3, which is simply an ordinary tap of a diameter that will cut a thread in the bushing. Thread this deep into the brass, and then drive it out with a punch. The

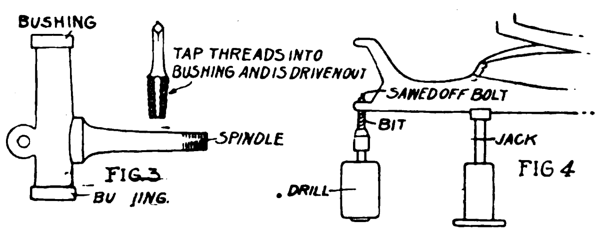

FIG. 3
FIG 4

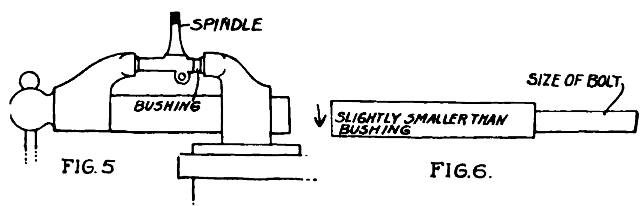

FIG. 5
FIG. 6.

bushing will be driven out with it. A special taper tap has now been placed on the market for this purpose, but any ordinary tap the right size will do the work.

The old bushings removed, new ones are forced in with the aid of the vise, as shown in figure 5. If the reaming of the bushings is done by hand it is a man's job, but if

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an electric drill is to be had the work is made easy for it can be done in 1/10 the time usually required. The drill is clamped in the vise, and the reamer fastened in the chuck. Even a small hand operated drill-press is a time, and labor saver in this work. Never run a reamer backwards, or you will ruin it. If it is a bit under size, shim one side of it with layers of shim metal, and let the exposed blades do all the cutting.

Removing Spindle Arm Bushings

The spindle arm bushings are removed with a special punch. The smaller portion of this tool is the same diameter as the spindle arm bolt, while the diameter of the part above the shoulder is the same as the bushing. This handy tool is shown in figure 6. A bolt with similar demensions may be used effectively. The head of bolt should be about the same diameter as the bushing.

If the threads in the axle are worn there is little use to rebush the spindles, for the bolt will work in the axle instead of the spindle. A Ford branch will fill in the holes, drill them out, and rethread them, for a dollar or two, or you may do this yourself if you are handy with a welding torch. I believe brass would made a better repair, and would be easier to handle. Care must be taken in drilling and rethreading.

The next step in overhauling the front end is to remove the steering rods. Remove the steering rod ball arm that is keyed onto the tapered end of the steering column. The rods are already unbolted from the spindle arms, so they are placed in the vise for repair. The two ball socket arms are removed, and dressed down with a file. They should fit snugly, but should not bind. Both cap and ball should be smeared with cup grease before re-assembling.

If the caps, and balls are badly worn a quick repair can be made by fitting thin sheets of brass to the inside of the caps. This will take up the wear.

Entire New Part Advisable

When the bushing in the steering column bracket is worn it is advisable to replace it with an entirely new bracket, rather than expend the time in removing, and replacing the bushings. The proper reamer for this work is not always to be had, and as the new bracket only costs a dollar it is not worth bothering about.

Occasionally the three small gears in the brass housing just blow the steering wheel become worn, and should be replaced with new ones.

After the front end is re-assembled, the wheels should be replaced, and the adjusting cones drawn up moderately tight, and then "backed off" a quarter, or half turn. Some mechanics "back off" the cone until the wheel just balances. This is all right, but if a new felt grease retainer has been installed in the hub, the felt may make the wheel seem tight, when this is not the case.

After the wheels are adjusted they should be carefully lined up with a gage similar to the one illustrated. It is very important that they toe in a quarter of an inch in front. New tires mounted on wheels that are an inch out of alignment will show fabric in less than a thousand miles. This fact is worth remembering.

COMING AUTOMOBILE SHOWS

January 28-February 4.
Allentown, Pa. Automobile Show. Lehigh Automobile Trade Association.

January 28-February 4.
Chicago, Ill. National Automobile Show. National Automobile Chamber of Commerce.

January 30-February 4.
Scranton, Pa. Automobile Show. Motor Trades Association.

February 4-11.
Youngstown, Ohio. Automobile Show. Automobile Dealers' Association.

February 6-11.
Schenectady, New York. Automobile Show. Automotive Dealers' Association.

February 8-11.
Flint, Mich. Automobile Show. Automobile Dealers' Association.

February 11-18.
Kansas City, Mo. Automobile Show. Motor Car Dealers' Association.

February 11-18.
Atlanta, Ga. Great Southern Automobile Show. Automobile Dealers' Association.

February 11-18.
San Francisco, Cal. Automobile Show. Motor Car Dealers' Association.

February 20-25.
Grand Rapids, Mich. Automobile Show. Automobile Dealers' Association.

February 20-25.
Syracuse, New York. Automobile Show. Automobile Dealers' Association.

February 22-25.
Trenton, N. J. Automobile Show. Automobile Trade Association.

February 26-March 4.
Des Moines, Iowa. Automobile Show. Automobile Dealers' Association.

February 27-March 4.
Springfield, Mass. Automobile Show. Automotive Dealers' Association.

March 6-11.
Indianapolis, Ind. Automobile Show. Automotive Trade Association.

March 11-18.
Boston, Mass. Automobile Show. Automobile Dealers' Association.

March 13-18.
Omaha, Nebr. Automobile Show. Automobile Trade Association.

March 15-18.
Port Huron, Mich., Automobile Show. Automobile Dealers' Association.

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A Few Odd Repair Jobs

Ingenuity Can Often Overcome the Handicap of a Meagre Automobile Tool Equipment

By James F. Hobart

A MOST distressing rattling thump developed seemingly in an automobile engine, which the most careful search could not locate or abate. Finally the trouble was run down, not in the engine but on either side in the rear-most shackles of the forward springs, upon which the automobile was suspended by means of hardened bolts and bronze bushings.

New bolts and bushings were procured but removing the old bushings proved a man's size job. There was no

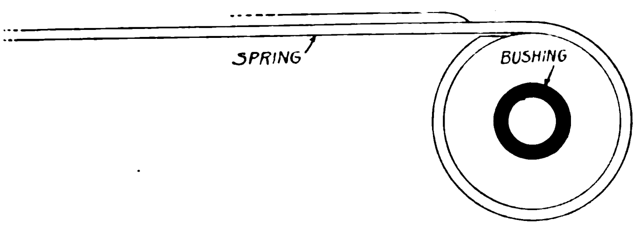

Fig. 1. Measuring the Circumference of the Housing.

chance to drive the bushings out as there was very little room behind and above the housings and there was no time to dismantle the engine to make working room. Finally the bushings were changed with homemade apparatus. Figure I—shows the location of housing and bushing. Two ferules ⅝-inch long and smaller than the bushings were cut from an old seat-post from a bicycle as shown in figure 2 and two more ferules which would easily slide over the bushings were hack-sawed from an old pipe coupling.

Removing the Old Bushing

There was no room to put the bolt through the housing from the back so it had to be placed as shown in figure 2 at the left, with a thin ferule back and next to the nut, and a larger ferule under the bolt head next to a washer to give good bearing against the head. Pulling was done by holding the nut and turning the bolt by its head. After the old bushing had been drawn the length of the thin ferule, the nut was removed and another short thin ferule placed on the bolt and a longer large ferule under the bolt head.

The bushing was pulled out far enough to grasp it with a pipe wrench, which quickly twisted the bushing out of its hole in the housing. The set-up for pressing in the new bushing is plainly shown in figure 2 at the right, and the home made apparatus did the job quickly and well.

A word of caution: when sawing tubing with very thin walls, be careful not to saw right through the tube or you will probably break out many of the saw teeth; figure 3 illustrates this point. Saw barely through the wall of the tube then revolve the tube slightly and make another partial cut as shown.

When A Drain-Cock Broke

If ever a man should answer in the Hereafter for his doing in this world, it should be the inventor of the petcock, too often used as a drain-valve on radiators, oil-pockets, etc. These infernal articles seem to be always leaking or getting broken off or filled with dirt. Would that some inventor bring out a *real* valve to take the place of the dinky little drain-cock!

One of them broke off a tractor radiator recently. As shown in figure 5, at the left, the thumb piece stuck up too far and was continually being hit. One day it broke short off as shown in the second sketch and had to be opened and closed by the pliers or with a small stillson wrench. Pretty soon the remainder of the stem was found to be well 'chewed-up" and it was determined to repair the valve before the stem got any worse.

The stem was filed square for a short distance, but not clear down to the body of the valve. Then a brass thumb or wing-nut was found which had a hole smaller than the valve stem. The hole in the wing-nut was drilled the same size as the square portion of the valve stem, then with a small square file, the hole in wing-nut was squared to admit the valve stem.

After the hole in the nut had been squared to slip

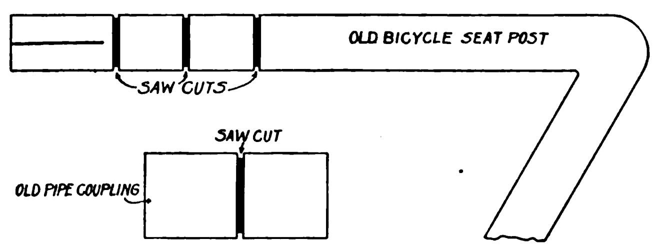

Fig. 2. Bushings Made from Bicycle Seat Posts and Pipe Couplings.

snugly over the squared stem, a bit of the hole in the nut was counterbored to fit the unsquared portion of the stem, so that the wing nut would not only bear fair upon the squared portion of the stem but also upon the unfiled round stem. In this way, great strength—that of the whole stem—was given to the connection of the nut to the stem and the squared place gave the necessary strength to withstand torsion when the valve was opened or closed.

A little soldering tool was made from a bit of heavy copper wire and tinned same as any soldering bit. Then the inside of the thumbnut was well tinned and the valve

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stem also tinned down as far as the nut would reach when in place. Then, both nut and stem—which had been removed from the body of the valve—were heated to melt the solder—driven together and when cold, the valve was as good as when new (but that's not saying much!)

Heat-Enlarging Engine-Pistons

When overhauling a tractor engine it was found that the pistons and cylinders had been worn to such an extent that while new oversize pistons were not imperatively necessary at that time, they would be needed in a very few months. Considerable oil was creeping through between pistons and cylinder and the compression was beginning to drop as a consequence.

It seemed hard to be put to the expense of new oversize pistons when they were then ot actually needed, so it was determined to try to expand the old pistons and if possible to make them large enough to be lapped into the cylinders again. Accordingly, the pistons were stripped free from rings and pins and the ring grooves cleaned of all dried grease and dirt which if left in the grooves during the enlarging process might cause hardening of the piston walls through carbonizing of the metal during the heating process; the carbon of the oil actually casehardening the iron of the piston where it came in contact therewith during the heating process.

The heating of each piston was done very slowly and evenly, care being taken not to heat one side or end before another part. If unequal heating was done, the pistons might be found bent, oval or otherwise distorted after they had again become cold, an ordinary smithy forge was usd for the heating of the pistons, two at a time being treated, being held by tongs, one piston with either hand.

A large fire was built on the forge, a circle being built up about sixteen inches in diameter inside, and four bricks high—laid flatwise—and placed loosely together around the forge fire which was then greatly enlarged by adding a lot of fuel until the space inside the bricks was well filled with coal which was kept well sliced and stirred up so that it coked well and evenly.

Each piston had a pair of tongs fitted to it and securely fastened by slipping a link over the tongs legs. As the fire began to come up through the coal inside the brick ring, the pistons were laid on top and rolled around and

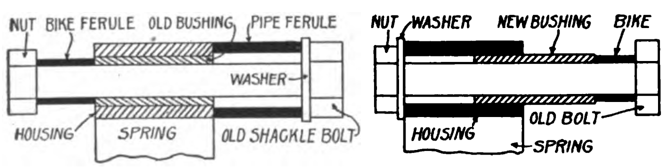

Fig. 3. How the Old Bushing Was Removed and the New One Forced In.

over every few second. As the fire expanded and crept farther through the coal, the pistonsw ere worked down farther into the burning coal and kept constantly in motion and keep getting slowly heated until at last, by the time the coal is well ignited, the pistons have become a dull red hot.

The cast iron pistons must be handled very tenderly when thus heated or they will be distorted beyond all recovery. But as soon as fully and evenly heated, remove the pistons from the fire and thrust them into clean dry sand, dry lime, or even into dry ashes—anything in fact which will keep the air away and permit the hot metal to cool slowly. After fully cooled, the pistons will be found slightly enlarged and may be big enough to permit of their being lapped into the cylinders in the usual way.

Second Enlargements Possible

Should the pistons be not enlarged quite enough, the heating should be repeated and done sveral times if found necessary. Cast iron and some other metals expand when heated and do not again contract quite as much when they cool. When heated repeatedly, the expansion each time is not quite as much as it was the first time, but still it is something even if it be slight.

Nuts and collars which are slightly too small may thus

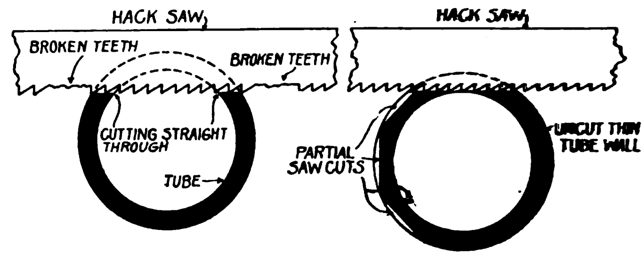

Fig. 4.—Illustrating the Right and Wrong Ways of Cutting Thin Tubes.

be made larger and bolts which are too small may be made larger by repeated heatings and coolings. But in case of bolts and nuts, the diameter of the articles is so small that the permanent expansion of the object is very slight indeed. In pistons of several inches in diameter, the permanent expansion after several or even one heating, is quite noticeable and may increase piston diameter enough to permit of lapping the pistons into the cylinders again.

New piston rings will probably be required in pistons thus enlarged for the width of the ring grooves will be slightly increased, as is the length of the piston as well as its diameter. But don't heat the cylinders for they will be larger after that treatment and oversize pistons will surely be required. It is for this reason that oversize pistons and new rings are usually found necessary in cylinders which have been repaired by the oxy-acetylene welding process. Then preheating of the cylinders enlarged them slightly and they took a slight but permanent enlargement when they cooled again.

Bushing A Timkin Bearing

Suddenly developed looseness in a front wheel of a Cadillac car was found to be due to the wearing out of the steel rollers. A spare Timkin bearing was always carried in the car but when put in place, the bearing was found to be for a 1⅝-inch journal while that of the car was only 1½-inch in diameter. No other bearing could be obtained and it was decided to "bush" the bearing so it would fit the shaft.

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A search around the garage revealed a piece of galvanized steel 1 1/32" wide and 1/16" thick. It was a steel trap which had been clinched around a bunch of galvanized steel plates shipped to the local plumber. The steel was found one day beside the railroad track. The writer always picks up and saves material which he finds adrift, and this piece of steel proved to be just the thing for the required bushing.

One end was carefully squared with a file, 5¾ inches were marked as shown in figure 6—and the end was bent up as far as possible to permit the steel to be cut off with a pair of snips. The steel proved a big mouthful, but was cut by working close to the rivet. After being cut off, the other remaining end was hammered down, using a piece of steam pipe for a "stake."

The steel was bent to a smaller circle than required until, as shown by the sketch, the ends lapped past each other. This was done purposely. It is always easy to make a short tube larger by hammering it on the outside and that was done with the bushing over a bolt or piece of pipe, until the ends came fair with each other and all the kinks had been hammered out of the bushing, which then proved a very little too thick and was dressed outside with a flat file until the bushing could be driven into the bearing and upon the automobile axle where it is still running well after months of service.

Going After Oil Waste

It was thought that a truck was using too much oil. Constant replenishing was required, and no one seemed to know what became of the large amounts of lubricants which were put into the engine and the transmission. It was suspected that there was leakage, so the owner spread

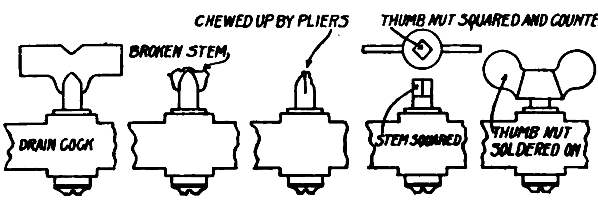

Fig. 5. How the Pet Cock Was Repaired.

clean papers under the truck at night and in the morning was rewarded with several small puddles of oil here and there on the papers. Before moving either the truck or the papers, the point was located where each puddle came from and a note carefully made of each place.

One leak was found in the bottom of the transmission case where there seemed to be a small crack. Not being able to have the case taken down and welded at that time, the owner mixed a lot of graphite with oil and poured the mixture into the case, hoping that the graphite would settle and fill the very narrow crack in the case. In a few days this was found to have been done and that oil leak was stopped. So well did the graphite do the work that it was not necessary to take down and weld the case. Seemingly the graphite had made a permanent cure.

Safety-Pin Wire Connection

The small milled nut of one spark plug had been lost, and another one which would fit, could not be found in the tool box with the machine. A stout safety pin chanced to be in the box, and this was used to make

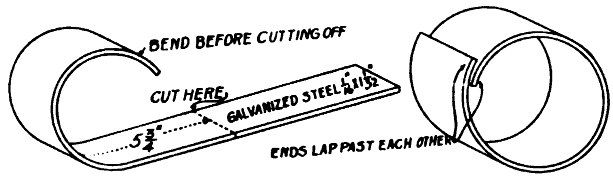

Fig. 5. Bushing a Roller Bearing.

connections between the cable and the spark plug. The bared end of the cable wire was twisted into the eye at one end of the pin, which was then bent so that, when closed over the screw thread on end of plug, the spring of the pin held tight against the threads, thus forming a good connection and one which could not be shaken off by jolting of the machine.

SPEEDOMETERS AS SPEED INDICATORS

By Geo. G. McVicker

AROUND most garages there are speedometer heads which have been used but for various reasons have accumulated. These may be used as speed indicators for taking the speed of shafts by merely attaching a stub to the joint where the flexible shaft is intended to be attached.

This point must be made so that it can be set in the counter sunk end of a shaft and of course so as it will not bind on the frame of the speedometer.

To use as an indicator, it is necessary to first test out one of the instruments with a known speed, or with a registering speed indicator, and a table or chart made to accompany the reading of the speedometer hand. This way, it makes a direct reading indicator, and by simply holding it on the shaft for an instant, the speed may be ascertained without timing it.

For instance if on testing one with a time indicating tester, and while the speed of the shaft is say 1000, the speedometer hand points to 35 miles per hour, it is then known and must be remembered or recorded that this 35 reading means 1000 R. P. M. Then take the speed of the shaft while the reading of the speedometer shows 25 M. P. H. By dividing each of the 5 mile markings into R. P. M. the exact speed may then be shown instantly on making contact with the attached point to the shaft. Some garages have a number of these old speedometers and by testing out one and making a table to accompany them they may be disposed of as speed indicators for more than they would bring if sold as junk.

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Automobile Dealer and Repairer

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

What Constitutes an Efficient Driver?

FROM the time when the automobile was ruled, by a certain Judge, to be a "Machine which is a menace to life and limb of the public," the question as to the use of the automobile has been seriously considered by our law makers.

A horse and carriage, a go-cart, or a bicycle are not, in themselves dangerous instruments. The horse may go amuck and run away and perhaps that might endanger lives, but in general the public can look out for itself in such a case. It is hardly conceivable that a go-cart or a bicycle can injure anyone in particular except under extraordinary circumstances. But the automobile is different.

Properly driven the automobile is harmless, but put this instrument in the hands of a careless operator or under the control of one who is incapable of driving it properly and it becomes a menace to public lives. It is for this reason that the public must protect itself, must license the driver and assure itself that the latter is capable of keeping the machine under control.

To accomplish this the law makers are steadily grinding out laws, and except in a few states the laws are entirely inadequate. A law is not a protection, it never has been, nor will it ever be. The law is merely a suggestion. One can break the law and there is nothing to prevent. Punishment may follow if one is caught in the breaking and this is the only incentive for the keeping of the law. Beyond this it is often a difficult matter to *prove* that the law is broken and unless a case is proven there is no punishment.

In the last analysis, then, the driver of the car is the sole agent to act for or against the hazard, not the law itself. And because this is a fact the law goes to the root of the matter and gives permission to certain people to drive and control that "menace of public lives," the automobile.

Up to the present writing the drivers are licensed only after having passed certain tests; we refer to those states which have a licensing system. These tests may be in the form of written questions or in the shape of a demonstration of driving ability, but is this law adequate?

A man may learn the road laws in his state, he may memorize them *verbatim* without realizing exactly what they mean and when he has done so he may pass the examination and be entitled to drive. If required to do so, he may guide a car through traffic for an inspector, and pass such a test as well. Naturally he is careful at the time, but as soon as as he has received his license to drive he may break all the laws made.

Again, he may be able to pass a written test and yet not be able to demonstrate his ability, and in certain states he need not do so, but is given a license. Our state laws should be uniform and every driver should pass both a written and a road test examination. But there is something even beyond this.

Before a man is intrusted with a driver's license he should not only know the law but he should be strong enough morally toobey it. And in addition he should be physically fit to drive.

We put this case before our readers with the request that they help us to obtain uniform automobile laws which will act to protect all of us.

The matter of physical fitness, though not as yet considered by the authorities who make our laws, is really of vital importance. You may tell a man that it is the law to keep his car on the right side of the road, you may fine him if he doesn't but who is to blame if he is physically unable to comply?

Very frequently we read in the papers of an accident in which "the driver lost control of the car." Is it not possible that the driver lost control of himself? Many people have a nervous temperament which seems to act to prevent them from doing the right thing in an emergency. We see this every day on the street when persons waver back and forth in front of automobiles; they cannot seem to make a decision.

Many people are afflicted with poor eye sight. They may be able to read and see for short distances, but beyond that everything is blurred. If glasses are fitted they may be able to see far ahead, but near by objects are then indistinct.

Some people are epiliptic, they may lose consciousness for seconds or minutes without being aware of the fact. And yet such people as we have mentioned can obtain license to drive an automobile.

In this city it has been found that the professional thief, crook and gunman can obtain a license to drive a taxi. Once inside of his car and you are entirely helpless, he can drive you to a secluded spot and help himself to your pocket book and you cannot get help.

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Moral and physical fitness are two qualifications which should be legally required of the applicant for an automobile license and until our law makers wake to this fact, the rest of us are being exposed to much danger.

The Deadly Carbon Monoxide

DURING the Winter months at least one person a day is killed by carbon monoxide, that deadly gas which is thrown out of the exhaust of the gasoline engine. The fact is the more appalling because it is an indication of gross carelessness. Fortunately in most cases, only the careless one suffers.

Until the motoring public is fully aroused and alarmed carbon monoxide will continue to claim its victims.

Carbon monoxide is a very peculiar product of combustion and is deadly because it kills without alarming the victim. It has no smell and once it has struck, death is certain. If you run the engine of your car in a closed garage you are taking a chance with the deadly gas. And even more, if you run the engine out of doors and keep the side curtains firmly buttoned, you are also gambling with death because the exhaust may be blown into the car through the floor.

Carbon monoxide is heavier than air and sinks in air. Thus if you are working in a pit, in a garage and there is an engine pumping the gas into the shop, the pit will soon be filled and the gas will work into your lungs.

Once in the lungs the gas chemically combines with the liquid portion of the blood, decomposes it and prevents it from absorbing the oxygen so necessary for life. Once this chemical combination has progressed far enough and the blood is broken down, there is no help and the patient literally "drowns." Oxygen may be pumped into the lungs but the blood cannot absorb it and life soon ceases.

The first sign of carbon monoxide poisoning is dizziness, but this is followed so soon by unconsciousness that the victim has no chance to escape.

Prevention is a million times better than cure because there is so little chance of a cure.

Health and Hazard Literature

THE Health Department of the City of New York is issuing a booklet which deals with automobile hazards. The book is written by Dr. Dana S. Hubbard, a well known authority on health subjects and who is now the director of the Bureau of Public Health Education, Department of Health, in this city.

In the book are taken up the various kinds of hazards which threaten the public and the individual relating to the use of automobiles. It is well written and is both interesting and instructive.

The Health Department also issues a chart, which is intended for display in public and private garages, dealing with the carbon monoxide danger. Every reader should have one of these charts and tack it to the door of his garage.

Both the booklet and the poster may be obtained, gratis, by writing to the New York Health Department, 505 Pearl St., New York City, N. Y.

WILL B. LANE PASSES AWAY

Will B. Lane, for many years President of the Will B. Lane Unique Tool Co., passed away on November 19th, 1921.

The business will be continued under the management of C. D. Lane, his son, who has been associated with his father for several years.

THE CHICAGO AUTOMOBILE SHOW

THE automobile show which will be held in Chicago from January 28th to February 4th will be the twenty-second under the auspices of the National Automobile Chamber of Commerce.

All space in the Coliseum and First Regiment Armory where the show will be held, was sold weeks ago, and the exposition will be a record breaker in many respects. There were so many applications for space that many had to be refused, and those who did obtain space are considering themselves fortunate.

There will be eighty-one automobile manufacturer exhibitors and one hundred and eighty-six accessory makers who have space. The very latest model cars will be shown and many new machines will be exhibited for the first time in Chicago.

As was noticed in the New York Show, the majority of car manufacturers have centered most of their efforts in improving the efficiency and increasing the economy of operation, and for that reason their products will probably be of more interest than ever before. It has generally been conceded that American coachwork and body design has been exceptional, and very little improvement could be made along those lines so that it would seem that the manufacturers' changes in the last year have been in the right direction.

With the exception of twelve cars, all those exhibited at the New York show will be shown in Chicago.

The accessory booths will be more attractive than ever before, and if the precedent established at the New York show holds good, the attendance at this portion of the exhibition will be unusually large, and greater interest will be evinced than in previous years.

A well known Chicago artist has been engaged to design the decorations and they will form a fitting frame for the beautiful cars that will be exhibited.

The stage is set for what will probably be one of the most successful automobile shows.

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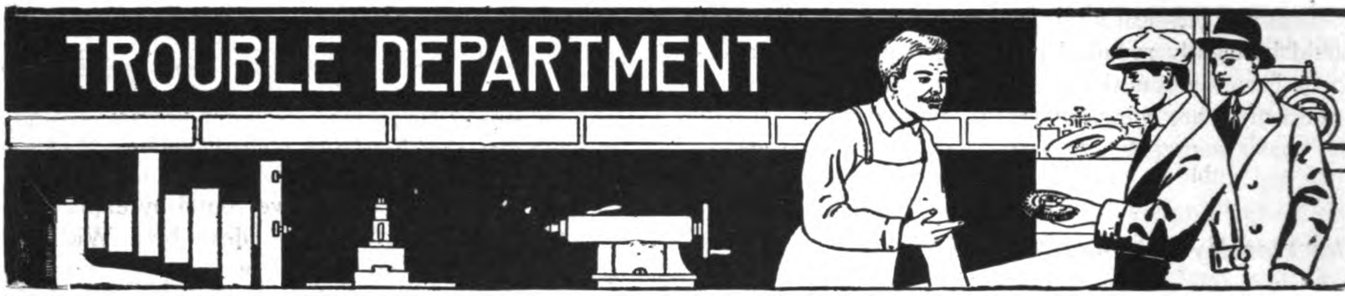

VERY evidently the reader who wrote the following bit of verse was humorously inclined; but then, our trouble department Editor, when he is not too busy, can negotiate a smile or so and in this case he managed to send as good as was received. Follows the letter:

Dere Bill:
I sold my lovely poodle, to buy a flivver car,
And how that Henry's actin', gives me a mental jar.
I wish you please would write, at once to let me know,
About this tiny hunk of tin, so I can make it go.

Do spark plugs sparkle very much, and should they hit the fuel,
Would I still have a auto'beel or just a mess of gruel?
And if a tire goes bust, dere Bill; I have no Jack or Jim;
Shall I go hock my diamond, or run back on the rim?

And when the fan belt breaks, what then is to be done,
Mend it with a hair-pin, or let the darned thing run?
And how about the tool-box as a place for keeping ice?
I understand that cars which heat, are not so very nice.

And as the car won't run at all, I'll wait for your advice.
If you will help me now, Bill dere, we'll share old shoes and rice.
As soon as you can find the time, please write me just a line,
I sign myself, as oft before, your own,
May Valentine, (Vera C. Harris).

* * *

And Bill's reply:
Dear May:
Some problems often vex, those folks with feeble intellex,
But Me! Gee Whiz! My gracious Gosh! Show me the Ford that I can't josh!
Why, Flivver is my name, and taming Fords is my pet game.
You write to just the boy, my girl, I'll give your questions all a whirl.
You ask a question 'bout spark plugs; say, tell me this, have you gone bugs?
Of course they sparkle, touch 'em once, they kick like lightnin', you big dunce.
Put them in the gas tank?—Well! Your Ford will only be a smell.
You'd better buy a tire jack quick, in case a tire is taken sick,
For if you *should* drive on a rim, 'twill never be the same agin.
And if the fan belt breaks, just stop, or else the engine goes ga-flop.

You'd better hock that diamond and buy a leather coat,
Then you can stand the wind and rain when Ford makes you the goat.
Don't put ice in the tool box, it don't help as a rule,
But keep a piece to sit on, it helps one to keep cool.
Please write again my Mary, you've got my address—dear,
Bring me your little problems, I'll always make them clear.
And as I close this letter, which proves I'm no mere boaster,
I want to say, go sell your Ford, and buy a roller coaster.

I've said it all, I've said my fill, I sign myself just—
Your friend,
Bill, (Trouble Dept. Ed.)

A Peculiar Carbonization Problem

3058

From Otto Tange, New York;—I have an old Buick car, (Model 10) in which I have installed Ford valves. I did this because it was the easiest thing to do, there being no Buick service station in my town, and because the Ford valves were somewhat cheaper.

Now these valves fit the engine perfectly and when freshly ground to their seats permit no compression leakage. The engine runs very satisfactorily and the car does the work, I have but one worry with it and that is, the valves tend to collect carbon too rapidly.

Under normal conditions I can drive the car for several hundred miles on one cleaning of the plugs, but at the end of the first 40 or 50 miles the valve seats are covered with carbon. Portions of the carbon tend to break off from the seats and faces and then the cylinder leaks compression badly.

At first I was of the opinion that the engine operated at too low a temperature for it runs remarkably cool for its age. But an examination of the exhaust valves and cages leads me to believe that this is not the reason for the trouble. I am writing to you to ask if you have any ideas on the subject.

Reply;—The mere fact that the spark plugs will operate for so long a time without carbonizing as compared with the time required for coating the valves is

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proof that general carbon formation is not excessive. Your letter indicates a local trouble with the valves and nowhere else.

The fact that the carbon forms on the seats and faces of the valves indicates explosion leakage. Your letter indicates trouble of equal amount with both intake and exhaust valves.

These facts coupled with the one that the car is 12 years old or more would lead us to believe that the valve springs are too weak to close the valves quickly enough, yet not so weak as to cause serious trouble. Our first advice is to install a set of new, strong, valve springs.

If this does not remedy the trouble we would suggest that you look to the valve clearance. Adjust all of the clearances differently; starting with a few thousands of an inch clearance on the first valve increase it with each valve until you have the last one open about 1-16 of an inch. A few miles of running will show just what is the best clearance both for intake and exhaust valves. You may find that a uniform clearance is not desirable. You may find that the trouble is obviated by a wide clearance, even though the engine operates with considerable valve stem tap.

If you are still troubled it will be well to examine the push rod lift. It may be that the cams are badly worn in spots and that the valves open fully, close part way, open again and then close, only to be pushed open again later on and before they should.

If this is the case, the only remedy is to install a new cam shaft. A partial remedy would be to adjust the clearance wide enough so that the valves will stay closed at all times except when riding on the tops of the cams.

As a matter of fact it is our opinion that the present day idea of extremely close valve stem clearance is to be criticized. It is true that an engine will operate much quieter with such a close clearance, and it will often work more efficiently, but we have found by experiment that a wider clearance is often desirable. With the wider clearance the engine is somewhat noisy, but there is no chance of the valves being held open. And the noise is not so annoying as the constant carbon trouble.

Wiring of Velie, Model 28

3059

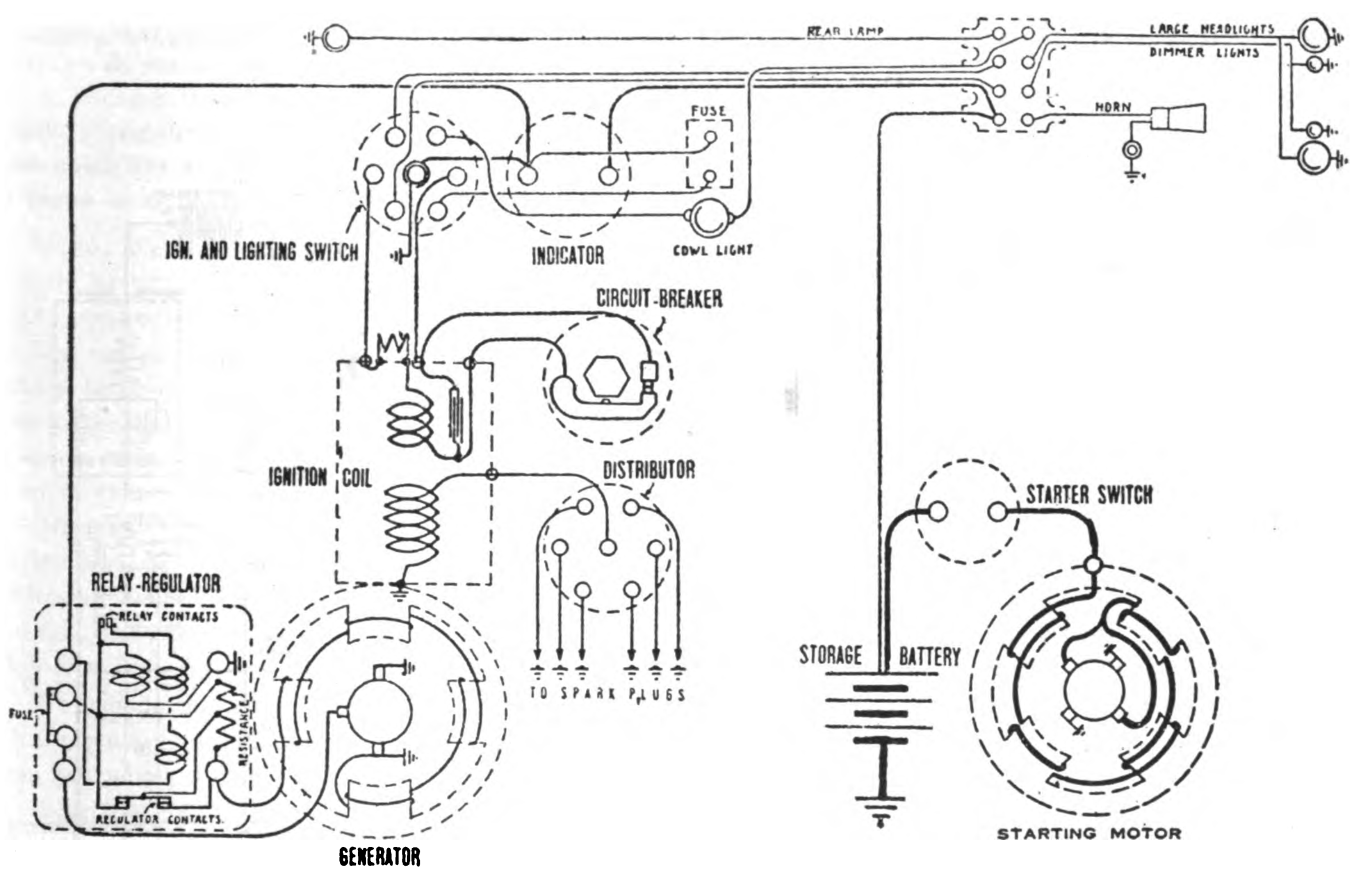
From Roy J. Smith, Rhode Island: Will you please print a diagram of the Velie, Model 28 Six cylinder car in the next issue of your magazine?

Reply: A wiring diagram of this model car is given below.

Starting-Lighting System for Ford Car

3060

From G. R. Cordero, New York: Will you please inform me at your convenience if a 1913 Ford car can be equipped with a starting motor, generator, battery and Bosch magneto for ignition as easily as can a 1921 model? Is it necessary to use a magneto for ignition if the car is equipped with a generator and battery?



Velie, Model 28

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Reply: Practically every manufacturer of automobile generators makes a special starting-lighting system for Ford cars and since the 1913 and 1921 Ford cars are of identical construction it is equally easy to fit either model with this equipment.

We might modify our statement somewhat by saying that our phrase "identical construction" refers to the front part of the engine where such units are usually installed.

There is a difference in the 1921 model Ford car in that the flywheel housing is cast with a fitting for holding a starting motor such as is sold by the Ford people.

It is not at all necessary to equip the car with a special magneto if a storage battery is used, or you can use the old system, or you can use the old magneto, or you can purchase a special ignition system, for there are many such on the market.

However, the Bosch people make a magneto designed especially for the Ford car and they also sell a fitting to adapt this machine to the Ford engine. We would advise you to write them for particulars.

Wiring of 1914 Buick

3061

From L. S. Sohn, Wisconsin: I have an old, 1914 Buick car, Model 37, I think. The wiring on this car seems to be badly mixed and I would like to have it correctly wired, but have no wiring diagram. Can you supply me with such a diagram? Are dry cells necessary for ignition?

Reply: The diagram of the Buick 1914 car is given below. Dry cells are not necessary.

Locating Engine Knocks

3062

From Herbert Hagan, Michigan: Will you kindly tell me what you consider to be the most exacting method for differentiating between main bearing, connecting rod, piston pin and pistol slap knocks? In most cases it is difficult to determine the real cause of the knock.

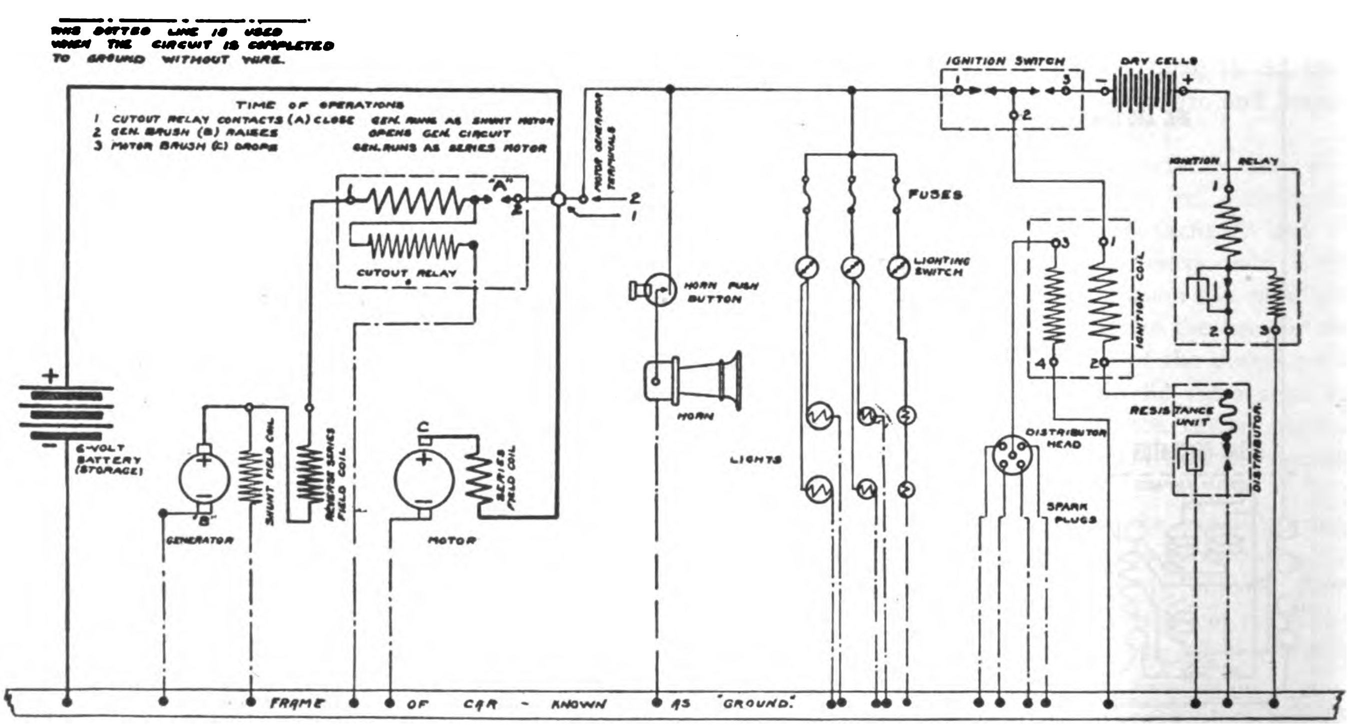
Reply: It is a very difficult matter to compile a set of rules which will definitely prove the type of engine knock resulting from the causes which you mention. In our experience we have not as yet found a repair man who will make a definite statement on this subject. The writer is unwilling to make any positive statement or can he give you any fixed rule for finding the origin of the various kinds of knocks.

As an illustration of the fallibility of rules the writer might mention the fact that he obtained the opinion of over 50 repair men as to the cause of the knock in his own car. Most of the men judged it to be a wrist pin knock and the writer had the same opinion. The knock *seemed* to be high up in the cylinder.

When the engine was overhauled, partially, the wrist pins and pistons were found in excellent condition and were not touched. It was found and proven that the knock was caused by *end play in the* connecting rod. And this end play was at the bottom, not the top.

Experience is the best teacher and we may go by a few general rules which may often be found at fault. If, for instance, a knock stops when ignition is cut off from a certain cylinder, we can be fairly sure that the knock is due either to piston slap or a loose wrist pin. To differentiate between these knocks is not always a difficult

BUICK 1914 MODEL B-36-37



Motor Generators Nos. 33-42
Battery—Type 3-X-15-2-C

Ignition Switch No. 1034
Ignition Coil No. 2107

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matter, for a piston slap will be more pronounced when the engine is cold than when it is heated. The wrist pin knock will occur, usually, both when the engine is under a load and when running idle and is more pronounced when idling along at about 30 miles an hour.

A slight connecting rod knock may not be evident except when the engine is pulling under a severe load, but may be confused with a carbon knock or a spark too far advanced. Of course the carbon knock is usually accompanied by vibration and is not confusing to one who is experienced.

Since the connecting rod knock, if the rod is fairly loose, occurs on both the up and down strokes, it sounds much faster than would a knock caused by a loose wrist pin.

This latter statement may help, somewhat, in differentiating between a connecting rod and main bearing knock. However, under normal conditions it is almost impossible to tell the difference between these two kinds of knocks. A thorough examination through the crank case is always the safest.

On the whole the sound detector or stethescope is the most dependable device. With this one may obtain a fair idea as to the general location and then follow up with an examination of the parts suspected.

What About Tire Pumps?

3063

From Wm. Atwood, Florida;—I would like to know why we do not see more about engine driven tire pumps. Is it because they have not proved practical and the public's confidence is lost? We rarely see an automobile nowadays so equipped and an advertisement of such a pump is a curiosity.

Reply: We could not resist printing your letter completely as you submitted it, even though it may not be quite appropriate for this department.

The engine driven tire pump is a very practical unit and is being furnished as standard equipment on a number of the high class cars. Many of the standard transmission units are designed with a plate on the side which may be removed and a pump attached.

Originally the tire pump was designed for application to the front part of the car. It was a removable unit and it was almost as unhandy to use as a hand operated affair. In fact many owners preferred the latter because it was less trouble.

We can do no better than to recommend the engine driven pump to our readers, if they can obtain one which can be applied to their cars.

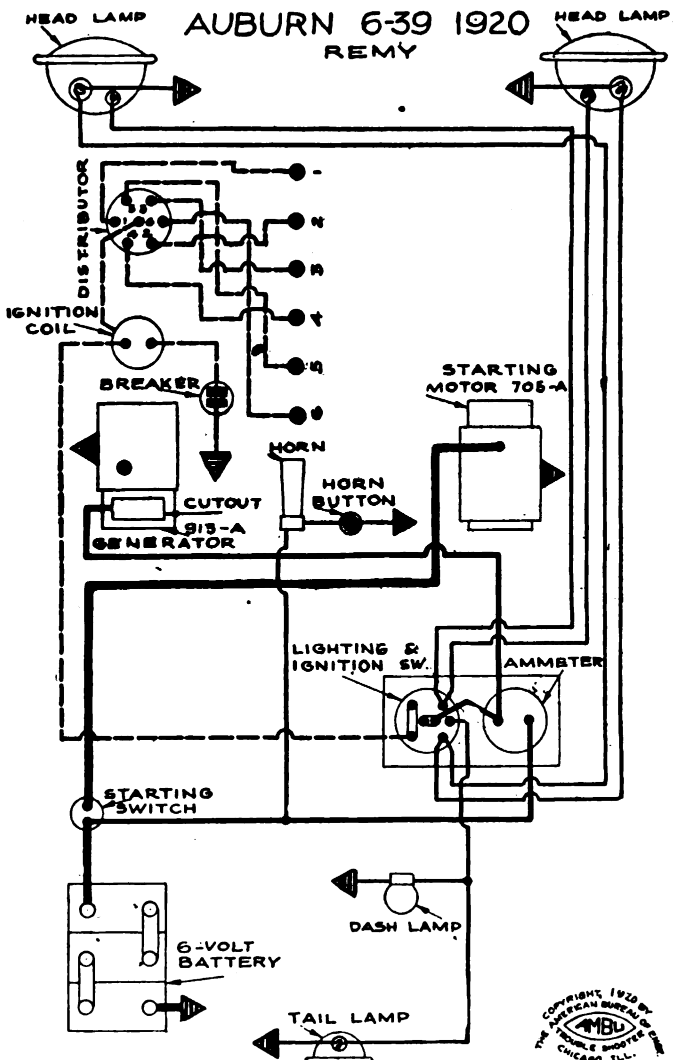
When the manufacturers of such pumps wake up to the fact that they must tell the people about their products, through advertising, they will be doing something which will be mutually beneficial.

1920 Auburn Six Wiring

3064

From E. Fenton, New York: Will you kindly publish a wiring diagram of the Auburn Six, year 1920?

Reply: The diagram requested is printed below.



Nº 244

Trouble with Bosch Dual Magneto

3065

From Archie Vardy, Pennsylvania;—I have a 1912 Crawford car which is equipped with a Bosch Dual Ignition system. Although the secondary current from the magneto itself seems to be properly timed the current from the coil, when the batteries are used, is much too late for satisfactory operation. I have made every possible adjustment and cannot seem to remedy the trouble. Can you help me?

Reply;—The construction of this machine is such that under ordinary circumstances the battery ignition is timed to occur 10 degrees later than the magneto ignition. Although the timing cam for the battery breaker arm is entirely distinct from the timing device employed to break the magneto current, the two parts are locked together in such a way that both must be changed at the same time.

The battery breaker cam is mounted on the shaft and

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the magneto breaker arm is mounted upon the battery breaker cam. In your case we are of the opinion that an error was made in mounting the magneto breaker assembly upon the battery breaker cam. We would advise you to return the device to the maker for repair. There is a Bosch Service Station in your city.

State License Numbers

3066

From John W. Davis, Deleware;—I am wondering if anything is being done to standardize State license numbers? Both the number of automobiles and automobile accidents are increasing in the same ratio and in many cases the drivers escape punishment because they cannot be caught. The witnesses see perhaps, the number on the car, but are not able to tell what state the car is from and so this information is worthless.

It is my idea that all the States should adopt a certain color scheme, each State will then have a standardized number plate which is so distinctive that any one can recognize it.

It would be an easy matter for everyone to become familiar with the various color schemes in the same way as the sailor recognizes the various flags. As a check on the system it would be well to have the state name and year of issue as is being done at present.

Reply;—Your idea is a good one and is advocated by every sane automobile driver and owner. Unfortunately, however, we cannot ever hope to have any business-like operation of State departments. The main thing which governs the various license bureas is the consideration of the revenue. Public safety seems beyond their ken.

The idea of having a distinct color, the same every year, is criticized because it enables a man to run along with old license plates with less chance of being caught. And this is the only argument against the system.

But, then, one or two States, which really have tried to remedy the evil have developed the idea of using the same two colors every year but changing the application. That is to say, one year the background will be black and the numbers yellow while the next year the background will be yellow and the numbers will be black. In a way this scheme has many advantages.

At any rate we agree with you that the plates should be standardized and perhaps if enough of the car owners will work together we can finally obtain a code of laws which will protect as well as prohibit.

Chandler Wiring Diagram

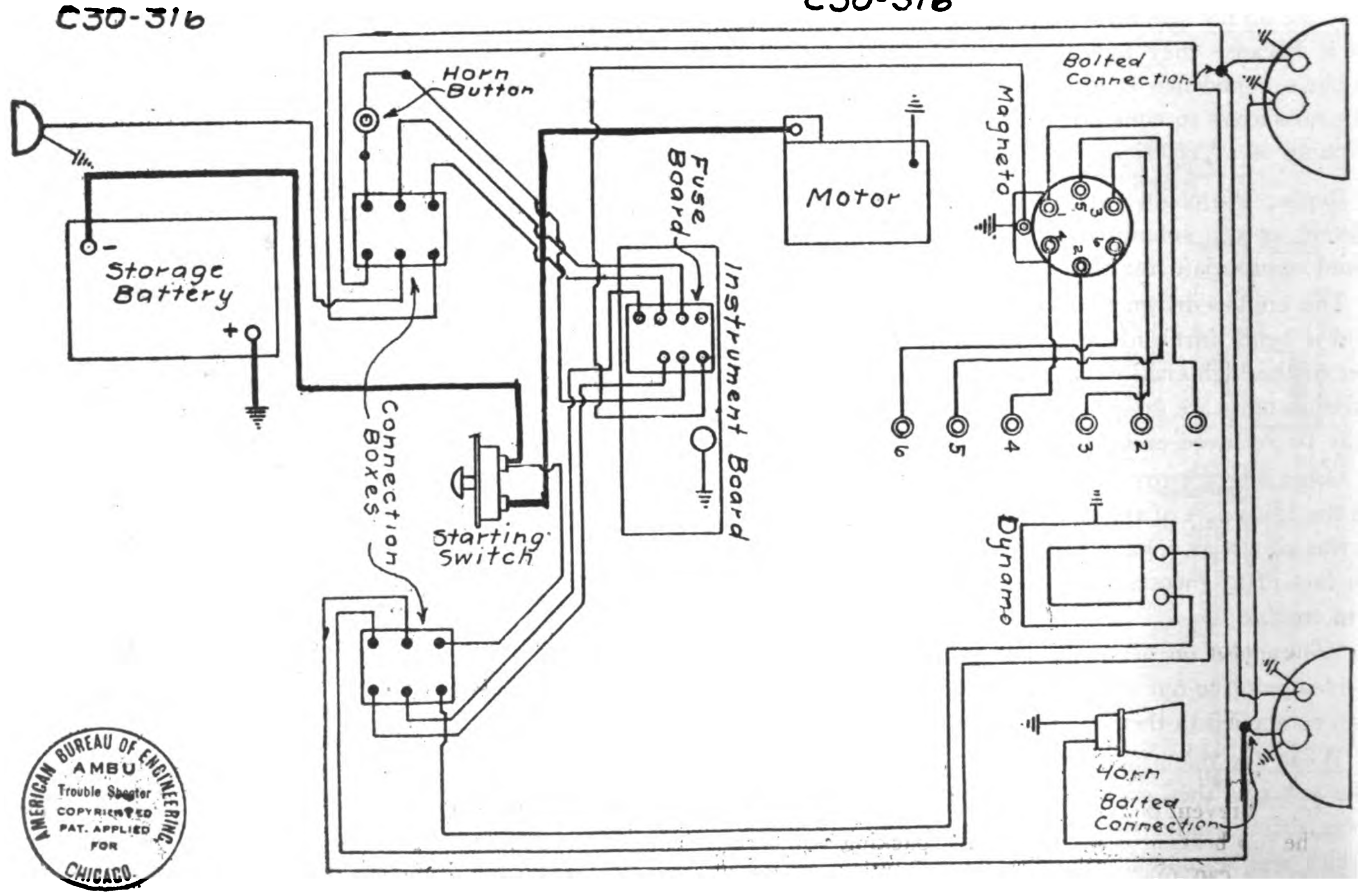
3067

From George H. Jaeger, New York;—Will you kindly send me a wiring diagram of the 1916-1917 Chandler Car?

Reply;—The diagram requested is printed below.

GRAY & DAVIS C30-316

GRAY & DAVIS CHANDLER 1916 "17"
C30-316



AMERICAN BUREAU OF ENGINEERING AMBU Trouble Shooter COPYRIGHTED PAT. APPLIED FOR CHICAGO

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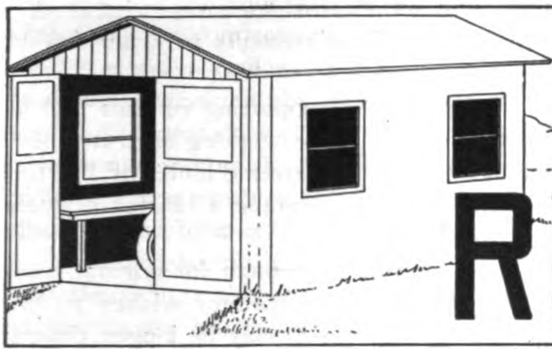


OUR OWN REPAIR SHOP

WE will consider, this month, a tool which migh be considered as being of primary importance in equipping a shop. The small shop owner may do without the larger machines, he may have much of his work performed in another larger shop, but unless he has some form of drill press and portable drill, he might as well go out of business.

The man who is limited as to his investment should always try to "double up" where possible on the machinery. By this we mean that he should purchase machines which can be adapted to many jobs in the shop. For example, let us consider the tool which forms the subject of this article.

Our drill press, which is illustrated, is made by the Standard Electric Tool Co. of Cincinnati, Ohio; and though it may be criticized as being small general drill press work, we have yet to find an automobile or body job of drilling, within reason, which cannot be accomplished in this machine.

Capacity of the Drill

By our term of "within reason" we refer to the size of the drill. The size which we have (type 4U) will take in a ½ inch, round drill shank and is capable of boring a ½ inch hole in steel, or a ¾ inch hole in wood. It will ream up to ⅜ inch. As to these rated capacities we will speak later.

The limit as to the size of the work put into the machine can be determined by studying the dimensions of the stand and the limits thus indicated may be increased to some extent if the machine is mounted upon a good sized, heavy work bench. This also will be taken up in this article, later.

The important unit of the machine is the motor. If the reader will refer to the illustration he will see that the motor unit is held in place by two gates, one at the top and one at the bottom. When properly locked in place the motor unit sets perpendicular to the drill bed.

The motor unit is of the universal type, that is to say, it will operate either upon direct or alternating current and we understand that it may be had in practically all of the standard current sizes. The armature shaft is mounted upon ball bearings which are fitted with rings and plates to prevent oil seepage into the motor box.

The top bearing is accessible, for packing with grease, when the cap or handle is removed, while the bottom bearing is lubricated from the reduction gear box. This latter unit carries a supply of grease which should last for six months of normal usage.

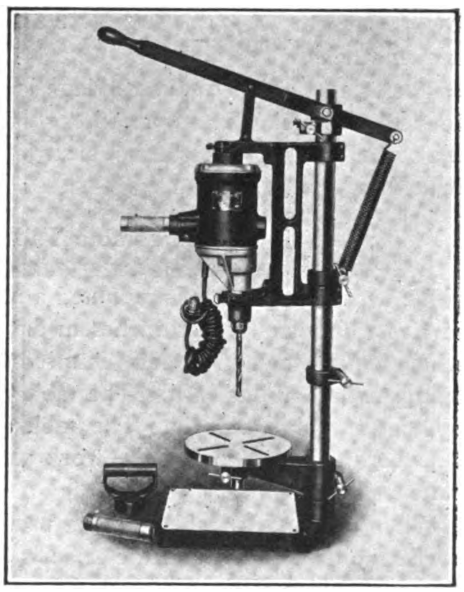
Mounted on the end of the armature shaft is a small cut gear which meshes with a second gear, the second gear is of double construction and drives the chuck shaft. All of the reduction gearing is ball-bearing mounted and the chuck spindle also carries a heavy thrust ball bearing. There is no appreciable side play in this latter unit.

Drilling Speed

A Jacob's chuck of standard, three-jaw construction taking in round shanks to ½ inch is mounted on the end of the driven shaft and travels at the rate of 450 R. P. M. We have found that this speed is adaptable to the drills and reamers within the scope of the unit.

The drilling unit is practically "fool-proof" and the working parts are fully enclosed and protected from dust and dirt. The brushes are totally enclosed and it is impossible for the operator to come in contact with them while the motor is in operation.

Holes through the top end housing and the lower rim of the main body admit air for cooling, while a fan of special design, mounted on the armature shaft, circulates the air.



The Standard Electric Portable Drill with the Adjustable Drilling Stand, Complete.

One of the handles, at the side of the drill, carries a push-button switch. While the machine is being used as a portable, the operator's thumb naturally rests upon

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the "off" button, so that should the drill or reamer catch in the work the operator automatically stops it instantly.

The other handle is removable in order that the unit may be placed in the stand. This statement also applies to the top grip. The whole unit weighs but 19 pounds.

On an average the machine costs about 5 cents an hour to operate, this figure being based on a electric cost of 10 cents per kilowatt and under normal load. The current requirements are so small that the machine may be operated from an ordinary lighting socket.

The universal stand measures three feet in height, the main supporting column being a splined shaft 1⅝ inches in diameter, rigidly locked into the bed plate. This latter unit is 10 to 11 inches in dimension and is milled true on its face and feet.

The Sliding Carriage

The sliding carriage is 12 inches in height and though it is designed to be used with the Universal portable drill unit, it is adaptable to practically any portable of another make, should the shop owner have already purchased such a device.

The carriage is reinforced by upright and cross members and machined to fit closely upon the supporting column at two points. At these points the circular fittings are slotted to carry two keys which slide in the supporting column spline. By this arrangement the drill motor can be moved up or down with a minimum amount of side play. In case of wear it is an easy matter for the operator to fit two new keys.

The upper part of the carriage is connected through linkage to a 20 inch arm. The arm is fitted with a heavy coil spring which lifts the carriage back to its starting position. The tension on this spring may be adjusted through a sliding collar on the column.

Sliding on the column and below the carriage is an adjustable collar which is designed for a carriage stop. By setting this collar it is possible to obtain any predetermined depth of hole.

The total traverse of the carriage is between three and four inches which is ample for ordinary work because the ordinary twist drill will not clear itself in holes deeper than this.

The Adjustable Table

Below the stop collar is mounted a movable arm which carries a circular table, 9 inches in diameter. The table, which is machined on its face, is fitted with four slots for bolting work or jigs to it. The table itself is adjustable up, down and circularly. The table carrying arm can be swung to one side and the work placed upon the bed plate.

When the circular table is being used the clearance between the drill chuck and the table is 8 inches while the clearance between the chuck and base is 13 inches. In other words it is possible to drill pieces up to from 11 to 12 inches thick.

The sliding stop, the round table arm, the round table and the feeding arm are all provided with T, hand-screw locks, so that the various adjustments may be obtained without the use of a wrench.

The distance between the supporting column and the center of the drill, which is the working clearance, is 6 inches. This means that the extreme limit for the tool, as originally designed, is, for example, a 12 inch diameter wheel, 12 inches thick.

Although this limit is broad enough for normal work, it frequently happens that the operator wishes to drill into the end of a member which may be longer than 12 inches. In our shop we have so arranged the upright column that it may be swung to one side, over the edge of the work bench.

Since the work bench is 3 feet high, we can drill into the end of any object four feet long or less. By means of blocking and boxes it is possible to arrange a support for any regular shaped piece of work beneath the drill.

If the drill is mounted at the center of the table and the latter firmly anchored to the floor the size of the work is limited only by the distance of the table legs from the center of the drill.

Suppose, for instance, it is desirable to drill a series of holes in the cross members of an automobile chassis. The work is such that accuracy is desirable and for this reason the members to be drilled must come at right angles with the drill. It is not advisable to use the portable, nor is it practical to dis-assemble the chassis and put it beneath the drill press.

Drilling Large Jobs

In such a case it would be an easy matter to run the chassis directly under the drill bench and to bring the drill carriage and the feeding arm down to the lower edge of the table. All of this can easily be done with the machine we are describing. By means of a spirit level it is an easy matter to set up the chassis beneath the drill and to drill or ream the holes perfectly.

Not only is this machine of use both as a drill press and as a portable drill unit, but it can be adapted to a wide variety of work commonly encountered in the repair shop. For the repair man who does not wish to go to the expense of fitting out a machine shop, the tool is a money saver. The car owner who does much of his own repair work will find that such a small drill press combination is a mighty good investment. We can illustrate this more fully by mentioning some of the jobs which we have done on this machine.

We wished to face off a few small, flat blocks which were to be used in making key stock. Since the keys were to be oversized we could not readily obtain the stock desired.

Upon the lathe we fitted up an arbor, with a ½ inch round shank and with a thread and nut on the end, to carry a four inch grinding wheel. The grinding wheel was of the semi-cup type, having a flat face and the retaining nut countersunk. With this wheel mounted in the drill press chuck we obtained a flat grinding surface.

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By moving the drill carriage to its topmost position and locking the stop collar against it the grinding wheel was held rigidly in place. The round table was next set to the correct position, for the key thickness, beneath the wheel and the key stock clamped on its face. By rotating the table the key stock was brought beneath the wheel and faced off as nearly accurate as in an expensive miller.

In a similar manner we ground off the faces on a set of gibs and slides for a milling tool. In this case, since it was the sides, rather than the top, we used a side guide clamped to the circular bed and fed the gib and slides through by hand in much the same way as one would feed wood through a circular rip saw. This job might have been done more accurately on a special tool, but was entirely satisfactory as it was.

Merely as an experiment we mounted a circular saw upon an arbor in the chuck and although we were somewhat limited, we found that it was entirely practical to use this device for cutting strips of thin metal to size. Wooden blocks clamped to the table served as guides. For general utility wood work, small stuff, this saw arrangement should be as practical as a larger machine, despite the awkwardness of having the saw revolve parallel with the bench.

It is only natural to suppose that a grinding wheel may be mounted in the chuck for finishing off welded members where appearance counts. As a portable grinding machine, the tool is entirely practical; the tendency of the fan blast from the motor is to drive away all dust from grinding so that there is little or no chance for the grit to work into the motor unless it is actually thrown into it.

As a fixed grinder one will find that such a small drill press is of great utility, for it will take the place of the hand file and do the work much smoother and more accurately.

The car owner who buys such a machine can always find use for it. He can use it for anything from grinding knives to beating eggs, if he is ingenious enough to fit it with the proper tools. Fitted with a buffing or polishing wheel the machine can be used for smoothing and polishing aluminum or brass parts and will work many times faster than brass polish.

Although we have already stated that the lathe is a complete machine shop in itself we will risk repetition in saying that this machine, within reason, is also a machine shop and will do many things which the lathe cannot accomplish.

In closing we might mention one fact which we have found out by experiment with this machine. It should be mounted upon a heavy, well anchored bench, as high up as possible so long as the operator can reach the feeding arm. If the height of the workshop permits, it is even advisable to fit a chain to the feeding arm and mount the drill so that the chuck comes on a level with the eyes.

With such a layout the maximum length of objects may be drilled.

THE AUTO-SHOP AND THE AIR-GAUGE

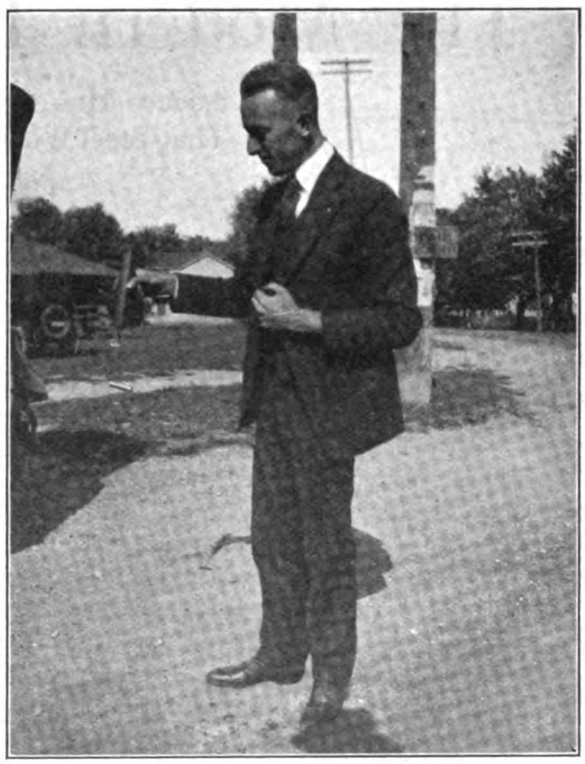
By Felix J. Koch

YES, of course, it's just a little thing, —a very, very little thing; but some one has said that big business is built, in last analysis, of little business; and that in both big and little business it is the small leaks that count!

Wherefore, one automobile service-station, the Venice (Ohio) Garage, has been giving especial attention to the matter of the air-gauge.

Venice is on the highway between Cincinnati and the big cities of northern and central Ohio and has become a great motor-touring stopping-place for luncheons, gasoline and minor repairs. In the warmer months especially, and particularly at week-ends, business with the transient motorists is all that can be desired.

Now if there is one thing which a motorist happens to be, more than any other, it is careless; he will forget to take some essential to good motor-travel along; or, having it, will forget to put it back into the tool-box the very first time it has been called into use. If there is one thing of which this is truer than all the others it is the little, nickeled cylinder which serves as tire-gauge.



Just a Little Thing, But So Easily Lost.

Come to a wayside station such as this one at Venice; investing in gas,—in oil,—perhaps in spare "boots" or even a tire,—the man will help himself to the "free air" the Venice Garage provides; as *why*, indeed, should he not?

Then, tires all but full, he finds he has mislaid or lost his gauge.

Can he borrow that of the Garage?

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Of course! What should the garage-keeper say otherwise?

Other cars stop for this,—for that; the garage-folk are busy elsewhere.

The man has his air; another car wants the place at the free air-pump next the drive; he is off and away!

The gauge, quite instinctively, he has tucked into his pocket, or dropped into the tool-box; or put where-so-ever he was accustomed to keeping his *own* gauge;—all quite unconsciously, of course! It is altogether too small a matter to deliberately steal and so, likewise, when he DOES discover what he has done, it seems to him altogether too trifling a matter to bother to return!

Now that one air gauge is, of ourse, worth almost nothing; at least nothing *to speak of!* But, multiply the loss of that one by the losses of the sort in a touring month; to say nothing of the losses in a year, and the thing becomes worth considering, indeed!

Wherefore, to repeat, the Venice Garage has pondered the question and results are patent out there today:—

Each wee, metal gauge has been fitted with a neat, but strong, metal chain; much the sort used for attaching license-checks to the collars of dogs.

Attached to the far end of such chain is a small, heavy wooden clog; too big to fit into any average pocket; really too unhandy to keep attached to a gauge which a motorist would carry about everywhere. Chains and clogs are attached, idle moments, by the repair-men of the garage at next to no cost at all.

Now comes Howard Fabing with his machine; getting air, and borrowing the gauge! He tests his tires;—is satisfied;—proceeds to drop the gauge into the pocket at the side of his coat. The big clog will not fit; it jostles him to one side. Or, the big clog catches at his fingers, or the chain snarls his thumb; he is brought back to himself unawares! Shame-faced, he returns the gauge whence it came; while the rest of his party laugh.

No, it isn't a big thing at all, this idea; but they tell us, here at the Venice Garage, it's saved them no end of cash.

The Modern Hardening of Steel

Science Has Progressed to Such a Point That Steel Working Is Not All Guesswork

By J. F. Springer

STEEL has been hardened for ages. Men have known for a very long period that, if a piece of steel is heated to red heat or above, and then dropped in water, its hardness will be greatly increased. It was a thing that they did not and could not understand; but they got the result all the same. In recent years, much more has been learned about steel and the process of hardening is now carried out with a better understanding. At the same time, there is still more to be learned about this wonderful metal. And this new knowledge—when we get it—will doubtless enable us to do our hardening to still greater advantage.

However, there are multitudes of people who are not hardening steel in the best way that is possible for them. They are unacquainted with what has been found out of late years and so are going on in the old ways, some of which have been found to be faulty.

I am inclined to believe that a host of people think they can make steel still harder, if they quench it at a high temperature rather than at a low one. Thus, they realize that a ball raceway made of very high carbon steel can be hardened by heating to a high red and quenching; but they think that they can get a still greater degree of hardness if they heat to a light orange or a yellow and then quench.

This is probably incorrect. The steel is no harder, but it is very certainly damaged in its structure. What *does* produce a higher degree of hardness, is a more rapid rate of cooling. This is something that is now well understood by some. Thus, if a piece of properly heated steel be plunged into a tub of brine, it will cool more quickly than it would if the tub had contained plain water.

Similarly, water will chill hot steel faster than will oil. So, if one wants to make the steel very hard, he does not heat it up to a bright orange or a yellow and then plunge it into water; but he mixes with the water a suitable amount of common salt, heats up the steel to a bright red and then chills it in the brine.

Furthermore, it has been found that as the quenching liquids gets warmer and warmer, the quickness of the chilling effect will, with some liquids, be decidedly altered. That is, for example, rather hot water will not chill the hot steel as rapidly as cool water, and so will not produce the same degree of hardness.

A very important matter, already alluded to in the foregoing, concerns the damage to steel when it is quenched at too high a temperature. This is something that seems to have been understood for only a few years. The older generations probably had some idea of the fact that steel should not be quenched from any such heat as a bright yellow, but they were not well informed and could not very well be, for the reason that it is only recently that the matter has come to be understood with exactness.

In fact, steel ought generally to be quenched at as low

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a temperature as possible, because there is very good reason to believe that every step in temperature above the absolutely essential hardening point is more and more detrimental to the quality—particularly the tensile strength—of the steel. Tempering does not restore it.

In view of what has now been said, it should readily be understood that persons who have the responsibility of hardening and tempering will do well to get a good understanding of what has been done in recent years and how it affects their work. I haven't suggested all the points, by any means. But perhaps I have said enough to make it clear that opportunities to get good solid information should not be neglected.

Heating the Steel

In order to harden ordinary tool steel, it needs to be heated and then quenched. The heating *must* be carried something above a point which may be approximately set at 1274 degrees Fahrenheit. This is a *medium cherry red*. Taylor & White set dark cherry at 1175 and full red or cherry at 1375. When tool steel has been heated, then, to something less than the last temperature it is hot enough to quench. It would seem probable that little or nothing is gained in real hardening effect by going higher.

It so happens that practical workmen will be apt to make mistakes in the matter of the exact color. The lighting of the shop may differ from day to day because of changes in the season of the year and in the weather Even on the same day, the light may vary a good deal between morning and evening. The way the light falls on the work will also affect the matter. Then the workman himself will vary in his judgment. If the work is done at one time by one person and at another time by a different person, then more confusion is possible.

However, if color is, after all, the thing upon which reliance is to be placed, the following rules will perhaps be of service.

(1) Select a corner or other spot near the forge where there is either no light from the outside or the forge; or, if this is not possible, where there will be the least light from sources outside the steel itself. In other words, seek to have things so that all the light comes from the heated steel.

(2) Do not depend entirely upon the language that something a little higher than medium cherry red is the color wanted. Your idea of this color may differ from what Taylor & White would have selected as half-way between their dark cherry and cherry or full red.

If the reader stops to reflect, he will perhaps have no difficulty in coming to the conclusion that the workman will naturally, in case of uncertainty, heat the steel up to a sure point. The effect will be to heat it higher than really necessary. A good way to test one's self as to ability to tell the color is to prepare a notched rod of steel and then heat it to a white heat at one end.

The notches may be set ½ inch apart and should be deep enough so that the rod can be broken readily. When the one end is white, there will naturally be a series of colors running down to, say black. Note the notch where the color appears to be just right for hardening. Then quench the whole heated part of the rod at one time, and break it at the notch noted. The file used on the fractured surface will show whether hardening has taken place. The rod may be of quite small diameter—say ¼ inch.

There is another way to determine the hardening temperature. It is much better than the color method, because it is more easily employed with exactness. It does not depend upon the weather nor the season nor the part of the shop where it is used. It has been found that tool steel loses its capability of being attracted to a magnet at about 1274 degrees, F. (medium cherry red), provided the steel contains 0.90 per cent of carbon or more. Now pretty much all tool steels (including the outside film of a case-hardened article) contain 0.90 per cent or more of carbon, so that what we really have to do is to find out when heating the tool steel whether it has lost its magnetic quality. If it has just been lost, the heating is to be carried a trifle further for two reasons: (1) to allow for some loss of heat between the forge and the quencher bath and (2) to make sure that the remaining

FIG.1

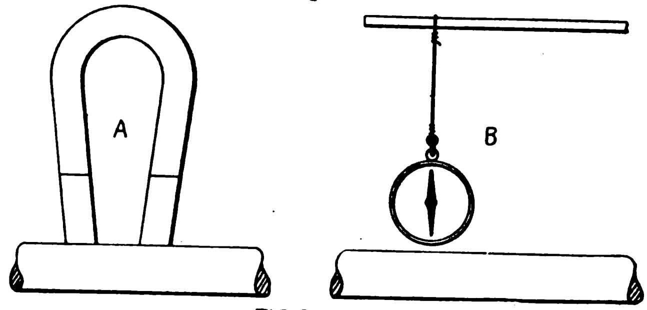

FIG.2

Illustrating the Test Rod and the Magnetic Method of Testing.

temperature is still distinctly above the magnetic point.

This method is superior to the color procedure if we have to do with tool steels containing less than, say, 0.90 per cent of carbon. The reason is this: For these steels the heating is to be carried a little higher—how much higher being dependent upon how much less than 0.90 per cent the carbon content is. In short, for these tool steels, the exact color will vary somewhat. However, in the case of the magnetic method, advantage may be taken of the fact that the magnetic point caries also—and, what is more, it varies just right. In fact, for all steels having more than 0.5 per cent of carbon, the heat point at which the magnetic quality is lost is precisely the point that is to be exceeded a trifle. The following rule covers the matter.

Rule.—Heat the steel just a little higher than the point at which the magnetic quality is lost and then quench.

The ordinary horse-shoe magnet may be used to test the heated steel for the purpose of ascertaining whether the magnet will tend to cling or whether it has lost its power to grip. But a magnetic needle carefully poised

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on a pivot may be still more satisfactory to some. Such a needle may be purchased in the form of a pocket-size magnetic compass and need not be expensive.

The needle is perhaps more sensitive, even though the brass case be not brought into actual contact with the heated steel. On the other hand, it is hardly as rugged an instrument as the horse-shoe magnet. When the latter is used, it is practically necessary to put it into actual contact with the work. It may be suspended by a light brass or copper wire from a steel rod and used in this way when the heated work is to be tested.

The Effects of Overheating

But some of my readers may be incredulous about the harm done by hardening from too high a temperature. So, I am going to give them an account of two automobile gears which were hardened at points differing only 50 degrees from each other. The account is taken from Bullens' "Steel and Its Heat Treatment," p. 71. The carbon percentage is not given, but it was probably a good deal less than 0.90. These steels require higher temperatures for hardening than tool steels.

"Two automobile gears were made from the same bar, by the same man, and in all other ways (were) as nearly alike as possible. The test was made by a disinterested third party.

"Number 1 was quenched in oil from 1450 degrees, F. annealed at 1400 degrees, hardened in oil from 1450 degrees, and tempered at 475 degrees, in oil. It gave a scleroscope hardness of 76 to 78. It withstood 48 blows of a 10-lb. hammer, dropping 30 inches, before a tooth could be broken out, or 8 blows of a 10-lb. hammer dropping 48 inches.

"Number 2 was quenched in oil from 1400 degrees, which was just over the critical range, and determined by when the magnet 'let go.' It was annealed at just under that temperature, followed by hardening in oil from 1400 degrees and tempering in oil at 475 degrees. The hardness was the same as with No. 1. In this case, however, it required 200 blows of the 10-lb. hammer, falling 30 inches, or 78 blows with a fall of 48 inches."

What a Few Degrees Will Do

Here we have a case where the difference in hardening temperature amounted to only 50 degrees. And yet, what an enormous difference in the result. No. 1 was perhaps a good gear—the ability to stand up until 48 blows were struck shows good strength and quality. But gear No. 2 was not only better, but so much better as to be in a different class. If 48 is good, what about 200?

The practical question comes up as to how the ordinary shop is to tell exact temperatures. It doesn't have to, is the answer. It is only necessary to use the magnetic method with intelligence. There are still other ways of controlling matters. The *lead bath* is the principal item in one of these alternative methods.

There are objections. One of them is this: When the temperature of the lead bath is carried up beyond 1200 degrees, F., "offensive and poisonous" fumes are given off.

There is, however, another alternative, applicable especially to steels having carbon percentages, say 0.50 and 0.90. Common salt and potassium chloride are mixed and then heated in a pot until the mixture melts and a slight increase above the melting point is gained. Common salt melts at about 1472 degrees and potassium chloride at 1325. By mixing in different proportions, melting points all along between 1471 and 1325 may be obtained. The right mixture may be determined by trial. Both substances are reasonably cheap. In mixing, one will, naturally, use more common salt the higher the temperature he wishes to get.

The bath is heated a little above the melting point and kept pretty steadily at the one heat. In order to test, at points all along between 1471 and 1325 may be obtained. any time, whether the temperature is really only a little above the melting point, one may use a steel rod. The rod is put down into the molten mass and after a few moments lifted a little. If a ring of unmolten material shows promptly on the rod, the temperature of the bath is probably about right. If, however, the rod is so hot up a ways from the surface of the bath that it refuses to cool enough to freeze the coating of the mixture on it for quite a little while, then the bath is to be judged too hot.

Advantages of Heating Bath

The advantage of this kind of bath is that the article may be heated in it without fear that it will ever get hotter than the bath itself. It will not be necessary to do all the heating in the bath. The work may be heated in some other way, if desired, until it gets near the temperature of the bath, and the latter used only to do the final heating.

One great advantage of using a bath is the fact that no overheating of any small parts of the work is then possible. No part heats up beyond the actual temperature of the bath.

Such a bath as the one described may be heated in several ways. Gas jets, oil flames and the fires produced by the use of coke or coal are more or less suitable. The use of gas or oil is probably capable of better regulation than is the case with solid fuel. There may be some difficulty in equalizing the temperature all through the bath.

Stirring is a useful remedy, and it is easier to carry out with a mixture of common salt and potassium chloride than with lead, because of the favorable difference in the weight of the liquids. Another advantage due to the same cause is that steel articles will sink in the chemical bath but not in the lead one.

Care should be taken to prevent the work from coming into actual contact with the metal sides or bottom of the pot or tub holding the bath. It may often be convenient to suspend the articles by wire.

(*Continued next month*)

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Seeing Things With Joe Bell

ONE of the very best things any car owner can do is spend a few hours on his back under his car, getting "a worm's eye view." He will learn a great deal that he could in no other way, he will familiarize himself with structural details that he never thought of before, and he will locate a dozen or more spots that require attention.

That chug chug heard when backing up comes from neglected looseness in the radius rod parts. The creaking, as of the body, really *is* of the body and both bolts that fasten the body to the right frame are found to be loose, allowing a movement as the car weaves with road unequalities. You often wondered why the brakes required so much effort to move them and now you know because you can see half a dozen joints in the mechanism that are muddy and rusty and there at the rear are four grease cups of whose existence you were in ignorance!

Yes, a few hours under the car is time well spent—better to do it all at once on the dry garage floor than by degrees out in the mud of the road. While there, oil and grease every spot that moves, tighten or try every bolt and nut, test every suspended part for looseness and rattle. And as long as you have your old clothes on and are getting familarized with things, drain all the cases and oil sumps and then fill them up with new oil. When these things are done, you may conclude after the road test that the old bus isn't so bad after all and it will do you for a year or two more.

THERE are people to whom the instinct of business is stronger than that of self preservation as I learned not long ago. We were working in the rain getting a car up the bank on that bad S turn out near Pine Bush. We had her almost out on the road again when our attention was attracted to a yellow closed car approaching at a rapid rate. It looked very much like the one belonging to Henchel, the real estate man. For some unknown reason they failed to slow up—striking the curve the car skidded and rolled over twice before our astonished eyes, the closed top completing the circle and the whole becoming a sort of hoop that rolled along the road!

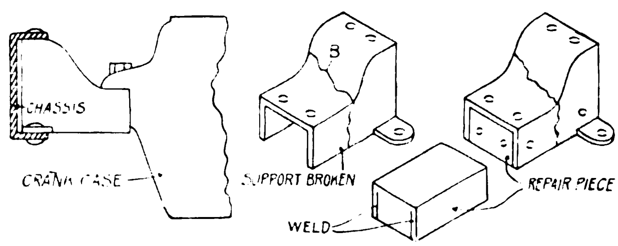
"Come on Joe," shouted the boss, "We'll see how badly they are hurt" and we left the one job where it was and ran to the second wreck. Two men were crawling out of the yellow car as we reached it; neither paid any attention to us; we heard these words, "Hench, you want a thousand too much for that darn farm." Yes, Henchel had been driving a bargain with one of his prospects and both men had been so engrossed that they hadn't been upset by the mishap that might easily have resulted in their death.

AS junk, old tires don't bring much money these days. But converted to other uses, the material has considerable salvage value. One man last Winter cut up four old tubes into inch wide strips for use around his house as weather strips on windows and doors; when he got through, he had enough left to sell that brought him in the price of one new tube. (It took time to cut the strips neatly but it was time that most people would waste.)

This same man had never favored the canvas strip, or flap, and never put them in his shoes. He had saved them until he had a dozen. These he took to an upholsterer who paid him the full price for them as he would for regular material that he used for supporting chair and sofa seats—both parties were satisfied, one getting a return for surplus junk and the other getting better material for the same price.

And when the scrap markets of the world get back to normal, auto owners should remember that tubes are nearly pure rubber and command double the price of shoes. Also remember to remove valve stems from tubes before selling the latter. At war and pre-war prices, junk men bought tons of tubes at shoe prices and tons of brass at one of the prices for rubber. If in doubt, ask your machinist friend before selling.

ON the Velie car there is used an engine support such as is shown by the drawing. One of these cars broke a frame at the middle of the support and the owner repaired it by putting a plate on, riveting it through the support and channel, and having the job welded for additional security. Later on, right in his busy season, he broke the engine support as shown at B. Unless the car was stripped, it was a simple impossibility to un-rivet and



to rivet on a new support because of the inaccessible location and in so doing there was the possibility of disturbing the frame repair. To strip the car was too long a job and the owner devised the patch that is also shown. This was made of 3/16 inch sheet steel, formed, and riveted to the old engine support where it was and to the frame. It served its purpose fully as well as anything that could have been put on and was still there when he sold the car.

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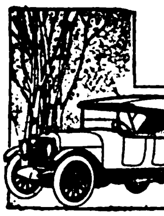
What Was At the New York Show?

A Little Light on the High Spots of Progress



IT IS a long comparison between Spring hats and automobiles but we have an idea which may be worth the price of a new bonnet for your better half. This Spring when your wife begins her annual nagging campaign for a new hat you will have a come-back.

Friend wife will start in by saying that the old car is good enough for another year, you will protest, but she will overrule your arguments by saying that a new coat of varnish will make it look just like a new car. On the other hand, however, her hat is a dead issue, styles have changed so much that last year's lid might just as well be tagged "out of date."

But as we said, this year you have a come-back, you can tell her that this year's styles of cars are absolutely new, the new models are distinctly nineteen twenty-twoish and last year's car is as passé as one of the '98 vintage.

If she won't admit the necessity for the new car you can fall back on the fact that, at least, you will need a new set of lights all around. Drum headlights, sidelights, taillights and so on are the last things in modern equipment. The old funnel shaped lights are as much a sign of out-of-dateness as an "orstritch" plume on a peach basket hat.

Probably the war is to blame, at any rate, drum lights form the equipment of nearly every new model. Another distinctive feature is the abundance of disc wheels.

It is no exaggeration to say that every car on exhibit represented an excellent value for the money for prices have been pared down to the minimum. In some cases not only have the prices been cut but the equipment has been increased.

Accessories, which in former days were never considered as standard equipment are now on the car when you buy it. And now, when you buy a car you can rather expect the term "fully equipped" to include at least a set of rear and front bumpers.

Wind wings, those sheets of plate glass attached to the wind shield are as common as wind shields were in 1906 and they surely add a touch of distinction of the car. Shock absorbers or snubbers are found on a large majority of the cars as standard equipment.

Now that the manufacturers are so keenly competitive they vie with each other to produce the best, fully equipped cars. A most careful examination of every car at the show fails to find a single one which can be said to be poorly finished or poorly designed. The bodies are roomy, rakish and well upholstered. One might shut one's eyes, pick out any car and feel that one is obtaining full value for the money.

A good illustration of how the manufacturers have standardized construction and cut down costs is had in the new Dort, light coupé and sedan models. In these cars are used the roadster and touring car bodies but with a top firmly welded to the lower parts. Thus it is possible to take advantage of quantity production in open cars and yet produce a closed car at but a small advance in price over the cost of the open models.

The Maxwell designers have overcome a big objection to disc wheels by producing a disc wheel with a demountable, split rim. Four wheels and an extra rim being standard equipment.

The problem of headlight illumination and road laws governing this phase of motoring is cleverly solved by the Lexington people. In their machine the headlight reflectors are free to swing inside the housing. When the car is standing still the light beams point downward, but when the engine is running the vacuum from the manifold is utilized to swing the reflectors upward. An adjustment on the dash enables the operator to obtain any adjustment desired.

The Nash machine shows a new kink in spring design. On this car the long leaf of the semi elliptic spring is topped by a short, stiff leaf which effectually checks the rebound and makes for longer spring life. A second, noteworthy feature in this car is the use of a four-inch wide service brake drum on the propeller shaft.

The new, roller tappet construction on the Cleveland engine is worthy of note as it is the first time such construction has been put in a car of this price.

Designers have spent much time on oiling systems and it may be said that this phase of the design is well taken care of, however in the Elgin car we find a feature entirely new. In this car the oil is fed to the overhead rocker arms through a hollow shaft. Thence the oil travels through the rocker arms to the ends of the push rods, down through the push rods to the tappets and the cams. It is the best example of a fully lubricated engine that the writer examined at the show.

To look at the Lafayette one might think that massiveness was an outstanding feature. True the engine is a large one, but what can be done in the way of reducing weight is evidence by the fact that the five bearing crankshaft with two-inch crankpins weighs but 30½ pounds.

The Alemite oiling system was much in evidence. There is a general tendency to design cars without hidden grease cups. In fact grease, as a chassis lubricator, is being displaced by oil. Hidden grease or oil cups are a thing of the past and many of the cars one may lubricate without soiling the hands.

Carburetion has been considered seriously by practically every manufacturer. Hot spots, combination mani-

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folds, heating stoves and so forth may be found in some form on every car exhibited. The Mitchell six has a cleverly arranged system of intake manifold. In this engine the gas is carried by an easy grade to two points mid-way between each set of three cylinders. At these two points the gas manifold again splits and is distributed to the cylinders. The total traveling distance of the gas from the carburetor to each cylinder is practically the same.

In line with carburetion and kindred evils we might mention the improvement made in the Hudson Super-Six engine. Heretofore, as our readers know, the Hudson has had a high compression engine which was designed some years ago. But with the advent of the low test fuels, this high compression was too great, once carbon had formed in the firing chamber. The Hudson people have increased the size of the explosion chamber and thus cut down somewhat on the compression.

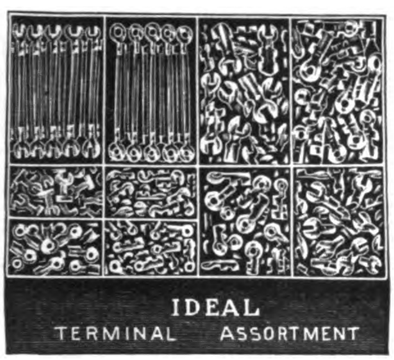
Space does not permit us to consider the new cars which appeared at the show for the first time.

Taken as a whole the show was a success. It served to bring the people to a full realization of the values in cars obtainable. It has helped to stabilize the industry and if the one at Chicago and that at Boston are as well attended, the automobile business is headed toward prosperity.

New and Useful Automobile Accessories

Terminal and Battery Connector Assortments

The Ideal Clamp Mfg. Co., Inc. of 198 Bradford St., Brooklyn, N. Y. is putting out an interesting assortment of battery terminals and connectors.



These units are put up in wood boxes so arranged that each type of connector or terminal is instantly available. Assortment A contains 300 terminals, two types, open and closed ends; and 100 battery connectors, open and closed ends.

Assortment B contains 675 terminals and 160 battery connectors.

Diamond Rubber Company Chooses New Sales Head

Along with new models of tires and new tire features, new sale policies and a new year, The Diamond Rubber Company, Incorporated, of Akron Ohio, announces a new Director of Sales, Mr. H. E. Kellor. He will have control of the sale of all Diamond products.

Mr. Keller has long been identified with the rubber industry as a sales executive. His experience has been unusually broad and varied in that it has embraced the sale of tires, mechanical goods and rubber footwear. He was for more than nineteen years with the B. F. Goodrich Rubber Company. Just previous to his appointment as Director of Sales of the Diamond Rubber Company, he was with the Diamond Company as District Manager.

The officers of the company have a formidable sales program outlined for 1922, one that is built around the bringing out of new tires and new ideas for selling them. Mr. Keller was chosen as the director to put through what is planned to be Diamond's greatest year of sales.

Universal Hose Clamps

One reason for the popularity of the Universal Hose Clamp which is manufactured by the Universal Industrial Corporation, Hackensack, N. J., is the fact that this clamp will fit any hose from one inch to three inches and up to six feet in diameter.

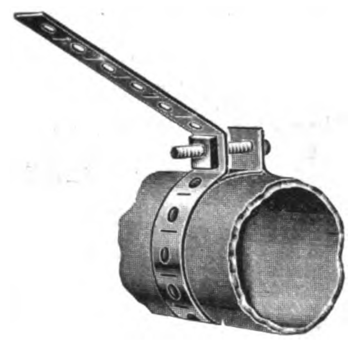
The device comes in two sizes, the "Junior," one-quarter inch to one and one-half inches, and the "Senior" one inch to three inches. It consists of a band of tough, cold rolled ribbon steel, a bolt and nut. There are holes every five-eighths of an inch apart in the band with scores between them.

It is only necessary to clamp the band around the hose, insert the bolt in the nearest hole, tighten up on the nut and then break off the over-lap.

Silent Merchandiser

In compliance with the general demand of dealers for an attractive and efficient means of displaying lock steering wheels in the stores the Lazear Products Company, 557 W. Quincy St., Chicago, Ill., have designed a display stand that is proving unusually popular.

This display stand is more than its name implies. It is, in fact, an effective silent salesman. It is made of cast aluminum, polished and attractively finished. The base of the stand bears the words "The Lazear Lock Wheel. Locks Without A Key." Counter sunk screw holes make it possible to fasten it to wall or counter—5 rubber cushions separate it from the counter or show case so that it will not scratch. It is substantial enough, however, so that it does not need to be fastened down, when used on the counter.



This stand supplies an excellent means of showing just how this lock steering wheel appears and functions when on a Ford. A slight pull down and back of the two thumb knobs on the underside of the spider frees the wheel and it spins freely on the post—while a turn of the Corbin key in the undiscernible lock engages it securely again, making ready for driving. This is all accomplished without in any way affecting the gears in the steering post. The stand is being sent free to dealers with their initial order for Lazear Lock Steering Wheels.

Oval Stop Signal

The Oval Stop Signal, a new and improved signal device, is being placed on the market by The Silva Mfg. Co., of Cincinnati, Ohio.

The new signal has a number of improvements and refinements not found in the ordinary signal. The materials used are said to make it impossible for the Oval to rust, while the parts have been assembled in such a simple, compact manner that it cannot rattle nor can dust or water get inside.

Every part of the lamp is of heavy gauge brass, heavily nickel-plated. The

inside carries a beautiful silver mat finish while the outside is finished in either highly polished nickel or double-coated with high-heat baked black enamel. Either finish will withstand all weather conditions.

The word "Stop" is embossed on the best grade ruby glass with fire-baked black enamel background to make it visible in both daylight and darkness. A 2 C. P. bulb furnishes the flash.

The switch is of a patented design, working like the hook of a telephone.

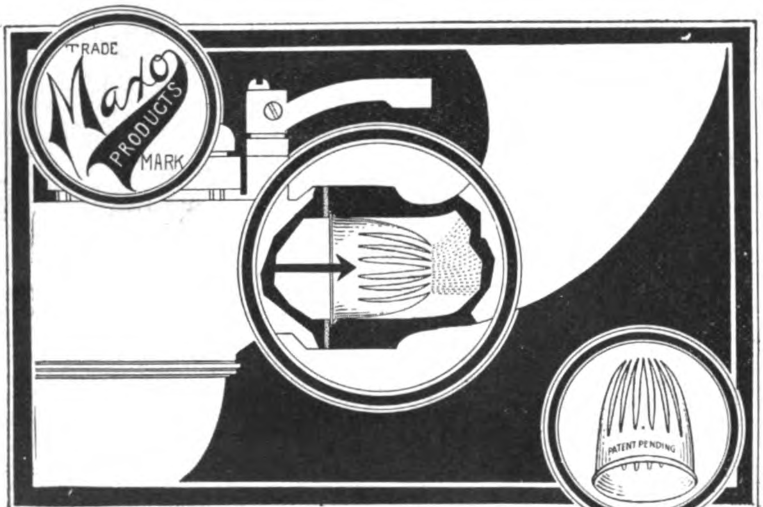
The signal derives its name from its exclusive "oval" shape.

The Maxo Re-Gasifier

The Maxo Re-Gasifier, manufactured and sold by the Maxo Products Corporation, 82 Wall Street, New York City, is the result of intensive experimentation and study to determine the best method of overcoming the difficulties encountered in using the present day low grade gasoline. The introduction of so called raw gasoline into the cylinders is responsible to a large degree for dilution of the oil in the crankcase, fouled spark plugs, carbon desposits, loading and difficulty in starting the motor. In addition to largely eliminating the above troubles it is claimed that the Mexa Re-Gasifier will increase the mileage from fifteen to thirty percent.

Simplicity of design and operation is the keynote of the Maxo Re-Gasifier. As the gas is drawn into the intake manifold from the carbureter it is forced to pass through the device. An examination of the cut will show that the teeth are slightly curved from the base to the point and are conformed inward. The incoming gas has a tendency to follow the conformation of the teeth. Thus, any gas that is laden with non-volatile matter or that has a tendency to recondense on the side walls of the intake manifold, is again broken up into infinitesimal particles which enter the combustion chamber of the cylinder in this more volatile state.

The Maxo Re-Gasifier is applied without alteration to the engine or carburetor, by simply lowering the carburetor, inserting the device in the end of the intake manifold, putting the gasket in place and re-attaching the carburetor. A new gasket is supplied with each Maxo Re-Gasifier to insure an airtight connection.



Thomson Spot Light and Control

It is claimed that the Thomson spot light and control, manufactured by the S. H. Thompson Mfg Co, Fourth and St. Clair Sts., Dayton, Ohio, gives the driver, while in driving position, complete control over the spot light's rays.

The device is made for both open and closed cars and the fact that it can be easily controlled from the inside of the car without the driver having to reach out and make adjustments should make it worthy of consideration.

It is well built, all exposed parts being made of bronze, nickel plated and is durable and light in weight.

It enables the driver to follow the road signs with ease at night because he can direct the spotlight's rays so that the roughest roads can be driven over with the same safety as is possible during the day. Further information relative to the ingenious device may be obtained by writing to the manufacturers.

Chromine Anti Freeze Compound

The Pyrene Manufacturing Co. of 17 East 49th St., New York City, well known manufacturers of fire extinguishers are marketing a freeze-proof or anti-freeze compound for automobile radiators.

"Chromine" as the compound is called is said to be harmless and non-corrosive and the manufacturers claim that it will not damage the hose connections or the water system parts. With the proper proportions of Chromine, the cooling system will withstand a temperature as low as 40 degrees below zero. Chromine does not evaporate and one charge will remain in the radiator the whole season, unless the water system leaks.

Re-charges Ford Magneto from A. C. Current, without Removing any Parts.

The Magnetizer Manufacturing Co., 146 West Florence Ave., Los Angeles, Cal., manufacturers of automobile accescessories and shop equipment, are now marketing a new and highly improved device for re-charging the Ford magneto. With this new device it is said the Ford Field coil can be cleared of all shorts up to the size of a connecting rod cotter pin, and the magneto recharged to full strength, all without removing a single bolt or nut, the device attaches to any A. C. light socket of 110 Volts or more, and will also operate from storage batteries,

dry cells, direct current and any farm lighting plant of 24 Volts or more.

The first "Colpin" magneto charger for Ford cars was put in use three years ago and has been put through a long list of tests and the result is, hundreds are in use here in garages, repair shops and authorized Ford agent's shops, and the device is highly recommended by them.

New Tonneau Shield

The Tonneau Shield Co., Inc., 47 West 63rd St., New York have placed on the market a tonneau shield for the small car which anyone can attach in a few minutes. All that is required is a ¼ inch drill, a hack saw, a screw driver and a monkey wrench.

This shield is absolutely guaranteed not to rattle nor vibrate and has all the features of this company's best tonneau shield, except that it is stationary.

The wings fold up and can be placed at any angle desired and locked there by the patented friction locks.

It is said to give ample protection on any small car. Completed attaching instruction are supplied with each shield. It is made in black enamel only.

Oakes Offers New Lock for Spare Steel Wheels

Designed to give the thousands of motorists now carrying spare steel disc or wire wheels, more adequate protection against spare wheel thieves, a distinctive and effective looking device has recently been placed on the market by the Oakes Company of Indianapolis, well-known in automobile circles as a large manufacturer of radiator fans tire carriers, tire locks and other metal parts for motor vehicles.

The new wheel lock is similar in principle to the tire lock perfected by this company several months ago. It consists of three simple parts, a brrel-shaped lock housing, with two wing arms, which

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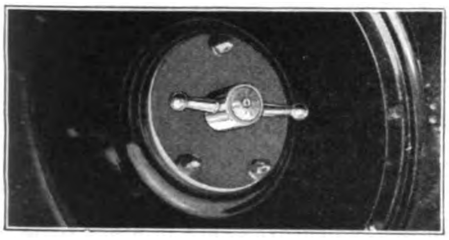
is an aluminum alloy casting reinforced with a hardened steel insert—a combination locking nut and washer—and a removable, non-pickable, dust-proof lock which fits into the outer end of the lock housing. The lock itself is held in place by means of two movable lugs which engage a flange inside the lock housing and are controlled by a key turning in a central slot.

The device is installed on the stud which projects through the hub of the spare wheel when mounted on the carrier, and is said to keep the wheel secure from theft until the owner's key is used to remove the lock. To install the lock, its makers claim, takes but a few minutes and can be done easily with the aid of ordinary tools.

After the primary installation, the device can be unlocked and the wheel demounted or vice versa, in a very short time, when the correct key is used.

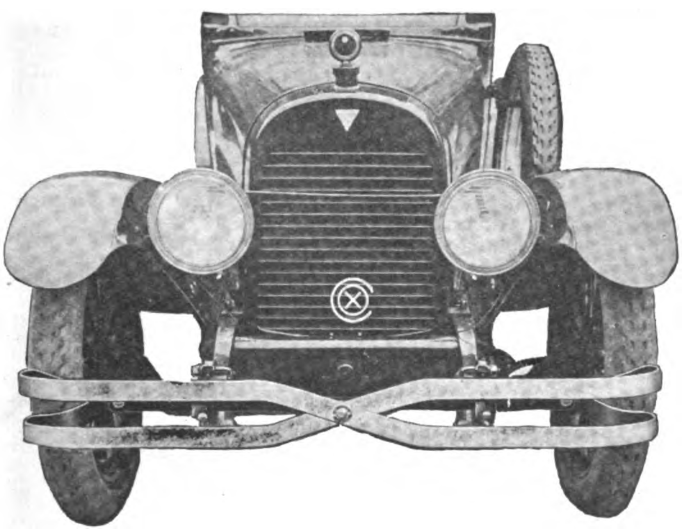
To make this lock a thing of beauty as well as safety, the lock-housing, wing arms and lock-face are highly polished.



The lock proper is a type approved by the Underwriters's Laboratories and has almost unlimited key changes. It revolves in the housing and hence is very difficult for a thief to force. The complete device is now for sale by leadin~ accessory dealers. A special model is made for Dodge and Ford cars equipped with disc steel wheels.

Hylo Bumper Model B

The Cox Brass Mfg. Co., of Albany, N. Y., and Cleveland, Ohio, is introducing a new type of bumper, as shown in the illustration. The style and appearance of this bumper are claimed to be distinctly different from any model so far brought out.



The four loop springs are connected in the center by a rigid arch which, it is claimed by the manufacturer, greatly strengthens the bumper and prevents vibration. As the loop springs extend entirely across the front of the car, they furnish a 6-inch impact surface, designed to fend off any protruding parts of other cars which might find their way above or beneath the ordinary 2-inch bumper.

The wide impact surface also helps to distribute the force of the impact and absorb the shock with the least possible strain or noise. They are made for the front and rear of all models of cars.

Bulldog Tire Lock

The manufacturers of the Bulldog Tire Lock, the Automotive Equipment Corporation, 105 West Monroe St., Chicago, Ill., claim that th's device cannot be picked or cut, and that it is approved by insurance underwriters.

This lock consists of a steel cable, rubber covered, which is clasped about the spare tires and locked by means of a hardened steel lock which is welded to the cable, and shuts in any position. Each lock is different, and the manufacturers state there is no "master key." They also chafes the tires.

Readers should write for full informa- state that this lock neither rattles nor tion in regard to this device.

Bu-Nite Pistons

The Bu-Nite Piston is not a new piston on the market. It has already had two years' service. However, the design, as shown in cut, is a development that has been brought about by continued practical tests, and the results are very gratifying to the extent that the manufacturers, the Butler Manufacturing Company, 3234 West Washington St., Indianapolis, Ind., guarantee to satisfy their customer with the results obtained.

The reduction in weight of a piston is a very important factor. However, it must be taken into consideration by an engineer that the piston is subjected to the extreme heat and the most severe punishment of any part. The material must be of superior quality, having bearing efficiency, tensile strength and the ability to transfer the combustion heat into the cooling system.

The manufacturers claim that the Bu-Nite Piston has these qualifications. The product is developed from the raw material entirely in the'r plant. Thus the qualifications are fully known and practical tests have proven that the material will maintain the ring seats, piston pin bearings, a~d a true diameter.

The proven tensile strength, the ability of the metal to conduct the heat out of piston, due to the nickle content and snug fit (which permits contact with the cylinder wall) and the use of the compensating skirt and expanding ring are the important factors entering into the construction.

Wedler-Shuford Equipment

The Wedler-Shuford Company, 19th and Locust St., St. Louis, Mo., is offering two new specialties to motor car owners through automotive supply dealers and jobbers. These are the Wedford Featherweight Clothing and the Evr Klean Seat Pad.

E. P. Weber Entering Manufacturing Tire Field

Mr. E. P. Weber, former General Sales Manager of the Bergougnan Rubber Corporation, of Trenton, New Jersey, an-

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nounces his resignation from that organization, to take effect January 12th, 1922.

This action is taken in anticipation of his entrance into the manufacturing tire field, but he is at present withholding information of the location of the new company and the names of its executives. Further information regarding this will be forthcoming in the very near future, as it is understood that no time will be lost in starting the new business.

Because of Mr. Weber's singularly wide and varied sales experience, it may be expected that the tire industry will hear some very original, clever, and sane sales and manufacturing plans as soon as the factory is ready to operate. Mr. Weber's present address is "Care of Sherman Hotel, Chicago, Illinois."

New Spark Plug Cabinet

To increase the value of an unusually strong advertising campaign, the manufacturers of AC Spark Plugs have brought out a unique and ingenious counter cabinet that is to be known as the "AC Quick Seller."

Because this cabinet was designed and decorated to preserve the impression of all AC advertising, it provides an efficient tie-up between the pages of leading magazines, billboards and the store dealer who sets it up.

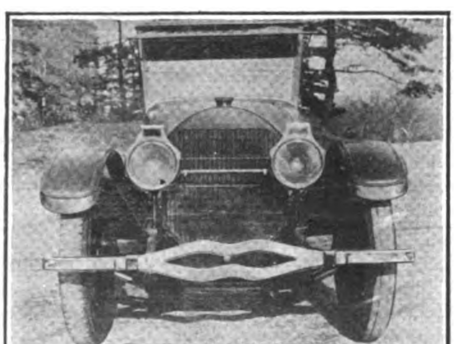
The "AC" Quick Seller" is made to hold a complete line of AC Spark Plugs from which any make or model engine can be equipped. Inside the cabinet is a simple chart that shows at a glance the correct plug for every motor.

Dealers who have already installed the AC Quick Seller report another valuable feature of the cabinet, pointing out that the dealer can tell at any time exactly the condition of his spark plug stock. This facilitates ordering and invoice. The Quick Seller also preserves the package, keeping it intact so that the customer may be absolutely certain that he is geting the genuine article.

The AC Quick Seller is being offered through all jobbers who handle these plugs. Additional information concerning it will be supplied upon request to the Champion Ignition Company, Flint, Michigan.

New Lyon Bumper

The Metal Stamping Company of Long Island City, manufacturers of Lyon Bumpers, occupied spaces D 191-192 at the New York Show and has arranged to occupy spaces 100-101 at the Chicago Show.



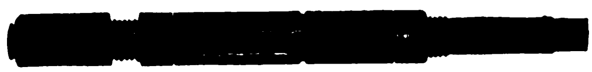
Not only will the Lyon Straight Bar Resilient Bumper (known as the Lyon Standard), and the Lyon Convex Bumper be shown, but also the new Dreadnought Bumper and the new Double Bar Bumper for Ford cars.

Resilient tests will be conducted with a spring machine which will prove the resiliency of these bumpers. Another new article of interest to dealers will be a portable display stand, mounted on castors. When rolled in front of an automobile it shows instantly the appearance of the car when equipped with a Lyon bumper. It will be furnished to dealers with orders for twenty-five bumpers.

Piston Pin Aligning Reamer

Chadwick & Trefethen of Portsmouth, N. H., the pioneer producers of Expanding Reamers for many years under the Critchley patent, request all repair men to ask their supply houses for this tool which resembles the Genuine Critchley Reamer as to method of expansion.

The entire reamer is longer, the blades are neutral for one-half their length, the neutral portion of the six blades act as a guide after the entering side of the piston has been bored. The guides consist of three splines that travel in transverse slots exactly as does the long cutting blade.



These reamers are made in size as small as 19/32 advancing by sixteenths of an inch up to 1-7/32. Larger sizes now being produced will ream piston pin bearings up to 2 inches.

Previous to the introduction of this reamer repair men were handicapped for want of a proper tool to do the most important work on a gasoline motor. With the use of this tool the replaced pin is placed in true alignment.

These Reamers are made by Chadwick & Trefethen, Portsmouth, N. H.

No-Leak-O Progress

1921 has been a record year for the No-Leak-O Piston Ring Co., of Baltimore, Md. No-Leak-O's sales increased 70% over 1920—itself a record year. No-Leak-O is, today, well on its way to becoming the largest selling replacement ring on the market. It is handled by over 200 leading jobbers throughout the United States and Canada. Constantly increasing demands prove it popularity.

Following a two days' sales conference at the factory at Muskegon, Michigan, No-Leak-O sales representatives from all over the country attended the Automotive Equipment Association Convention at Chicago. On November 17th a dinner was given by John E. Norwood, president of the No-Leak-O Company, in celebration of the Company's eighth birthday. In an interesting address, Mr. Norwood outlined the Company's phenomenal growth and addressed many compliments to Glenn W. Barkrader, Sales Manager for No-Leak-O.

The Drednaut Shock Absorber

The Auto Specialties Mfg. Co. of Saint Joseph, Michigan, is marketing a shock absorber, the Drednaut, which is designed for Ford cars. These shock absorbers have a number of interesting features.

Such is the design of the device that the car is suspended directly upon the axle, through the shock absorber. By this construction the springs are protected from side sway.

The car is supported upon the heavy coil spring of the shock absorber which absorbs all downward movement. By a clever arrangement of the absorber arm, the rebound is checked to a greater degree than the downward movement.

Officers of B. J. S. Products Corporation

The B. J. S. Products Corporation, manufacturers of "Leterain" the chemically impregnated mitten for prevention of rain adherence to automobile windshields, have elected new officers as follows: President John C. Baker, consulting chemist of Wallace & Tiernan, Belleville, N. J.; Vice-President, S. S. Parsons, Philadelphia; Secretary-Treasurer, Francis J. Tietsort, New York.

The corporation has made considerable strides in obtaining important new business in the last 60 days, and production is steadily increasing under new sales direction. Distribution arrangements are being effected for Great Britain, Western Europe, and all the British colonies and dominions. Eventually all export distribution will be handled through a royalty arrangement with a large London house, on a basis of manufacture in England. The general office of the corporation, with factory and warehouse, is now at 23 Washington Street, New York. The National Equipment Co., Commercial Trust Building, Philadelphia, has made a contract for general distribution of Leterain throughout New England and the Atlantic Seaboard states.

A Correction

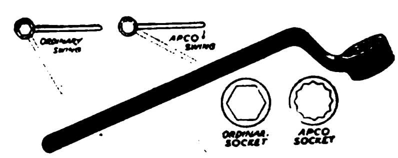
In the advertisement of Chas. E. Miller, Meridian, 14th & Main Sts., Anderson, Ind., printed in the November issue of the Automobile Dealer and Repairer a very bad error was made.

The price of the "All-in-One Vulcanizer" manufactured by Chas. E. Miller was given as $551.00 although the correct price is $155.00. This was a typographical error on the part of our printers.

Readers will do well to investigate this excellent vulcanizer, and all inquiries should be sent to the address given above.

New Apco Wrench

The Apco Manufacturing Company of Providence, R. I. has just announced a new one piece ratchet wrench which they claim is the only wrench made which will fit and operate satisfactorily on the fourth connecting rod of the Ford engine.



The wrench is made in a forging and the particular feature of the wrench is the fact that it gets twice as many grips as the regular socket wrench and this is because there are twice as many cuts in the Apco wrench.

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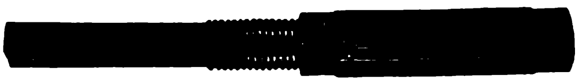
Chadwick & Trefethen

Portsmouth, N. H.

are the original and only makers

of



Genuine Critchley Expanding Reamers

Others advertised as Critchley Reamers are imitations. Genuine Critchley blades are replaceable like blades in a safety razor. INSIST on the GENUINE. If your Supply House does not serve you, write us.

Chadwick & Trefethen

Portsmouth, N. H.

STOP MOTORS SMOKING

Costly oil-pumping carbon, and disagreeable smoking of motors can positively be prevented by using

PRESSURE PROOF PISTON RINGS

The expander, an important feature of Pressure Proof Rings automatically takes up the slightest wear. Oil cannot pass the ring to ignite in the combustion chamber and form carbon and smoke. one 3-part ring or two 2-part rings is a full piston equipment. Thus first c st is low. Long run economy and a definite saving uel and oil has satisfied thousands of users.

PRESSURE PROOF PISTON RING CO.

107 Massachusetts Ave., Boston, Mass.

Canada: Pressure Proof Rings, Ltd., Sun Life Bldg., Sherbrooke, Quebec

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Again KANT-SKORE PISTONS *WIN!*

WESTERN UNION TELEGRAM

NEWCOMB CARLTON, PRESIDENT GEORGE W. E. ATKINS, FIRST VICE-PRESIDENT

RECEIVED AT ELLICOTT SQUARE BUILDING, MAIN & SWAN STS., BUFFALO, N. Y.

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KANT SKORE PISTON CO

MUTUAL LIFE BLDG BUFFALO NY

HUDSON CAR EQUIPPED WITH KANT SKORE PISTONS WINS CUP IN SECOND EVENT MAKING SIXTY ONE MILES PER HOUR ESSEX ALSO WITH KANT SKORE PISTONS TURNED TURTLE MAKING SIXTY MILES ON SECOND RIGHT ANGLE CURVE

GEORGE COPPER

824P

In Kant-Skore Pistons alone does the CLEARANCE remain the same whether driven at hill climbing contest winning speed of 61 miles an hour or at 2 miles an hour in traffic. The patented spiral slot, an exclusive Kant-Skore feature, makes this possible—Weigh Lightest—Fit Tightest.

THE KANT-SKORE PISTON CO.

CINCINNATI, OHIO

Branches: Buffalo, Kansas City, Los Angeles

$100 to $200 Monthly Profit

Re-charging Ford Magnetos

The "Colpin" magneto Recharger for Ford cars clears all "SHORTS" in the magneto coil and Recharges the Magneto to full strength in less than 5 minutes without removing a single bolt or nut "No storage batteries needed." it operates from any alternating current light socket; will also operate from Farm lighting plants, Direct current circuit, storage batteries and dry cells. Nothing to wear out. No up-keep cost. Weighs 12 lb. Used and recommended by Authorized Ford Dealers.

ORDER ONE TODAY. Price $57.50 complete. Agents get your state rights now. A 90-Day trial, money back if not satisfactory—protects you. Catalog FREE. Write today.

MAGNETIZER MFG. CO.

146 W. Florence Ave.,
Dept. M 600
Los Angeles, Cal.

Buy the Best

TRI-PLEX

A High-Grade Battery

Fully Guaranteed

Specimen Dealers' Prices
Tax Paid. F. O. B. Chicago, Ill.

6 Volt—11 Plate, Standard, $12.80
(For Ford—Dort—Chevrolet 490, etc.)

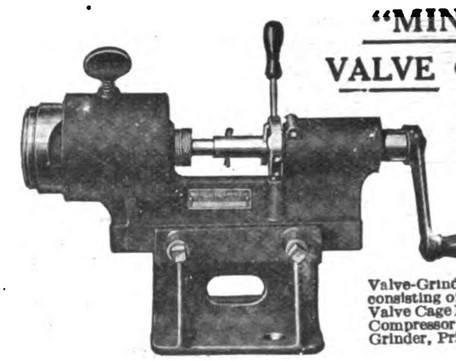
6 Volt—13 Plate, Standard, $14.40
(For Buick—Overland—Studebaker, etc.)

12 Volt—7 Plate Standard, $16.90
(For Dodge—Maxwell (2 or 4 Wire), Franklin, etc.)

These Prices for C. O. D. Shipments

We have complete line of Parts—Plates—Cedar Separators.

TRIPLEX BATTERY CO., 1109-11 Tacoma Bldg., Chicago, Ill.



"MINUTE" VALVE GRINDER

For Buick

Price with stand

$10.00

Valve-Grinding Set, for Buick, consisting of Rocker Arm Lever, Valve Cage Remover, Valve Spring Compressor and "Minute" Valve Grinder, Price $15.00

Write for Catalog of Newton Indispensable Tools and Equipment for Service Stations, Garages and Owners.

THE NEWTON MFG. Co. Plainville, Conn., U. S. A.

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The space available on this particular job makes a special wrench absolutely necessary and the manufacturers guarantee that the new Apco Wrench will not slip and being made in a high carbon steel forging it will not break easily.

This item is to be marketed through regular jobbing channels the same as the regular Apco line of equipment for Ford cars.

Officers of Tiffany Mfg. Co.

C. W. Curtiss, formerly General Manager of the Splitdorf Electrical Co. and later President and General Manager of the VanSicklen Speedometer Co. until its sale to the Stewart-Warner Speedometer Corporation, has taken a substantial interest in, and been elected President of the Tiffany Manufacturing Co. of 50 Spring Street, Newark, N. J.

Associated with Mr. Curtiss are Mr. Paul J. Landemare, Secretary & Treasurer, formerly Treasurer of the Splitdorf Electrical Co. and later Controller of the Van-Sicklen Speedometer Co., and Mr. Carl T. Mason, Chief Engineer, formerly Chief Engineer of the Splitdorf Electrical Co.

The Tiffany Manufacturing Co. manufactures a line of high grade automotive electrical specialties, such as Ammeters, Cut-Outs, Parking Lams, etc., for both manufacturers' equipment and the jobbing trade.

Messrs. Curtiss, Landemare and Mason's long years of experience in similar lines and records of exceptional success in building up the companies' business and standing of which they were the active heads, to large and profitable proportions, insures the Tiffany Manufacturing Company's becoming an important factor in the trade.

National Front Wheel Bearings

The National Bearings Company of Lancaster, Pa., are making a front wheel ball bearing to fit Ford, Chevrolet, Oakland and Dort cars which has a number of interesting features.

This bearing, which is in reality a bearing retainer, consists of a steel housing which fits inside the cups and cones and conforms to the outline of those units fairly closely. The retainer is fitted with recesses in each of which is placed a steel ball. New balls may be put into place should the old ones wear or break.

Akron Rubber Mold Products

The Akron Rubber Mold & Machine Co., organized in December 1909, with a factory and office force of five men and growing quickly to one of the largest firms in their line in the country, is presenting a most complete line for this year, including everything required by the rubber manufacturing and tire repair trade in the way of equipment and tools.

A range of vulcanizers is offered in both the self contained type and the separate boiler type covering either fabric or cord tires from 2½ to 5 inches; also a line of giant pneumatic truck tire vulcanizer molds in 6, 7, 8, 9, 10 and 12 inch sizes in both flat and round contour treads.

The line also includes a cavity retreader, one third circle, with self-contained steam boiler, which has been on the market for about three years and is used and endorsed by many of the leading manufacturers and large tire repair shops and schools.

In addition the company manufactures a most complete line of tube plates, inside patch vulcanizers, steam generators, inner tube vises, tube deflators, splicing mandrels, etc., as well as a large assortment of tire repair tools, some of special design.

Among the popular vulcanizer outfits are the "Akron Rubbermold" Improved Type A, a three cavity machine with self-contained steam boiler. The cavities of this equipment were redesigned a short time ago to take up all sizes of cord as well as fabric tires up to 5 inch.

The Type F is also a good seller whereever a moderate priced equipment is desired. The Type F is a two cavity machine with self contained steam boiler, tube plate and inside patch vulcanizing attachment.

Another equipment of The Akron Rubber Mold & Machine Co. which is much in demand, is their Improved Type E Cavity Retreader. This model will accommodate all makes of tire from 3 to 5 inch, both cord and fabric. It is fitted with a self contained steam boiler, and is recommended highly.

Particulars regarding "Akron Rubbermold" tire repair equipment may be obtained by addressing the General Offices of the Company, 915 Sweitzer Ave., Akron, Ohio.

Deglarescope Now Ready for Market

From the faculty of the Massachusetts institute of Technology, where many noted practical inventions for commercial use have originated, now comes what is regarded in many quarters as the real solution of the glaring headlight problem.

The device is called the "Deglarescope," and is unlike anything now on the market. It has been designed and developed to a point of practical use by Wm. Suddards Franklin, Professor of Physics, and Elof Benson, Curator of Apparatus.

In explaining the principle of the "Deglarescope to several practical automobile men, Professor Benson said:

"The problem that the illuminating engineer has had to face in considering the automobile headlight problem, has been not only to keep all light out of the eyes of the approaching driver, but at the same time to project enough light forward so that the operator could see the road at least two hundred feet ahead of his car.

"When Professor Franklin and myself attempted the solution of this problem, we decided that the only way to really eliminate glare was to hide the source of light, which means not only the filament but the entire reflector, from the approaching driver's eye, for as long as the eye can see any spot on that reflector, some glare is bound to be the result We did not want to interfere with the projection of the direct or horizontal rays, comprising the main beam of light, yet it was necessary to turn down all upward out-of-focus rays. In other words the upward, or glare rays, must be picked out and deflected, without interfering with the horizontal, or distance rays. I think you can readily see how we have accomplished this by looking at the Deglarescope. All direct, or horizontal rays, are projected through plain, polished glass, while all upward rays are reflected, not refracted, downward.

The Deglarescope Co., 1310 Maple street, Detroit, has been organized by Toner and a few other well-known figures in the motor world, and they are now ready for production.

Alben Combination Anti-Glare Shield and Mirror

The Alben Combination Anti-Glare Shield and Mirror which is manufactured by the Alben Mfg. Co., 7016 Euclid Ave., Cleveland, Ohio, is a very attractive device and should meet with the approval of all who drive cars.

This device consists of a rectangular mirror, three by seven inches which is easily attached to the top of the windshield, in the center. In this position the entire roadway, from curb to curb is visible, instead of a small section on one side as is the case when the mirror is only a side one.

A touch of the finger drops the Alben glare shield and the bright lights of an approaching car do not blind the driver. This is also useful in preventing the reflected light from wet pavements, and the glare of the sun, from dazzling the eyes of the driver.

Readers will do well to investigate this product.

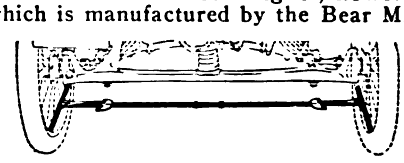
Front License Brackets

The matter of holding license numbers is one that frequently puzzles the car owner. One tends to punch holes through mud-guards or fenders and make a messy job, or to wire them to the radiator and thus court a multitude of troubles.

There is but one clear, sure way, and that to clamp the number plate to the headlight cross-bar. For this purpose the Ideal Clamp Mfg. Co. Inc. of 198 Bradford St., Brooklyn, N. Y. makes a special clamp. The clamp is made in two pieces which clamp around the bracket, firmly and yet hold the number plate so that it cannot rattle. A projecting lip on the bottom of the clamp fits into the number plate slot.

Bear Wheel Aligner

It is surprising how many car owners are fastidious about all the little details in regard to their cars, but neglect the fact that the wheels are out of alignment. With the Bear Wheel Tligner, however, which is manufactured by the Bear Mfg.



Co. of Rock Island, Ill., this adjustment is easily made. It is simply necessary to place the aligner in position as shown in the cut and the arrow and dial on each end show the exact position of each wheel. The aligner can be left in position while the adjustment is being made and the arrow and dial will show when the alignment is perfect.

The manufacturers claim that this device will show up all defects in the spindles, bearings, bushings and tie rods.

It is well known that imperfect alignment is the indirect cause of many accidents and wears the tires badly. With the aligner above described, these troubles are obviated.

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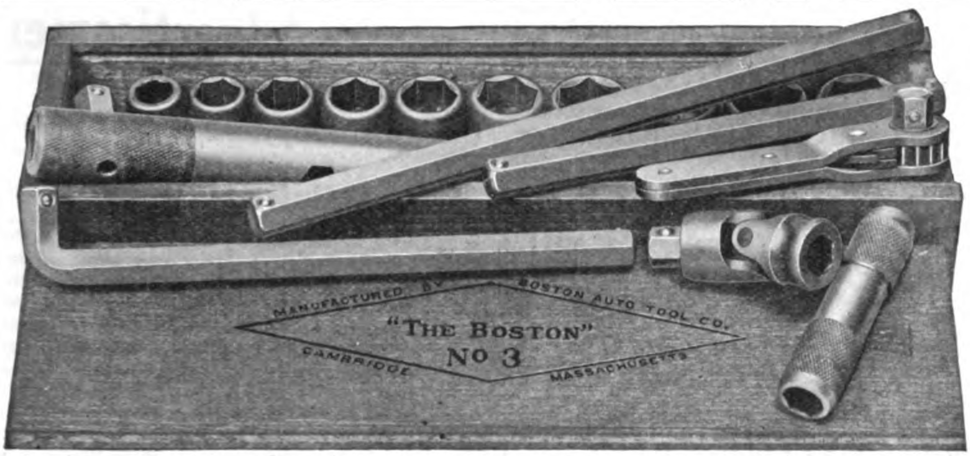
ORIGINATORS OF THIN EDGE SOCKETS

"THE BOSTON" NO. 3 SOCKET SET



Built to a new degree of accuracy — specialized and perfected so that they may be used in places where sockets could not be used before, and when used in connection with the extensions "T" Handle, Ratchet and universal joint, there is no bolt or nut that cannot be reached.

All the clever arguments in the world can never make you forget these advantages.

We have other sets—sockets guaranteed—ask any automobile mechanic. Write for circulars. Special Sales Agents Wanted.

BOSTON AUTO TOOL CO.
17 Tudor Street
Cambridge 39 Mass.

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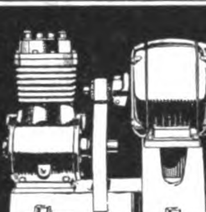

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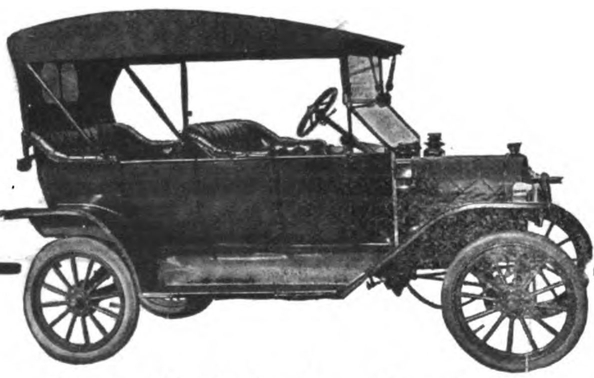

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Entered as Second Class matter January 15, 1921, at the Post Office at Cooperstown, N. Y., under Act of March 3, 1897

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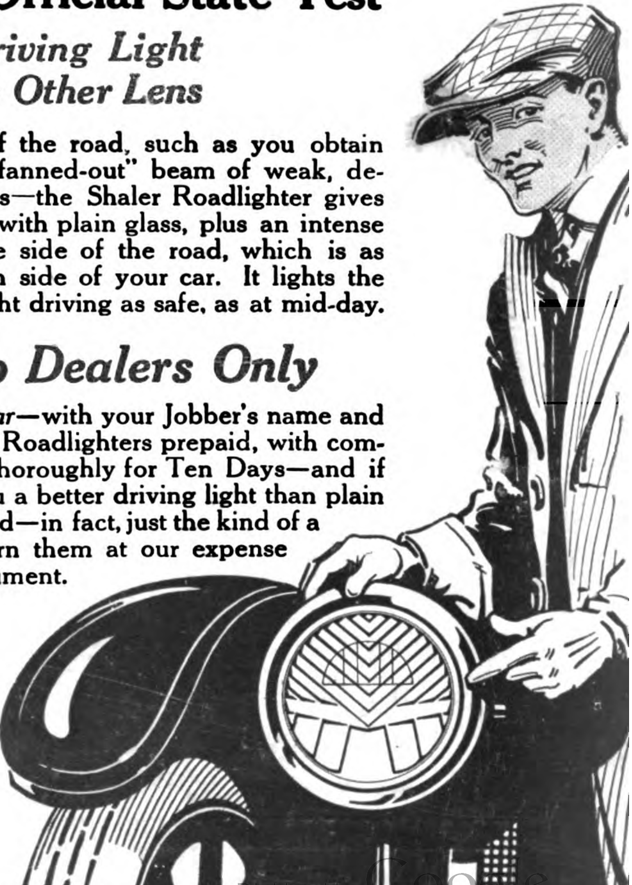

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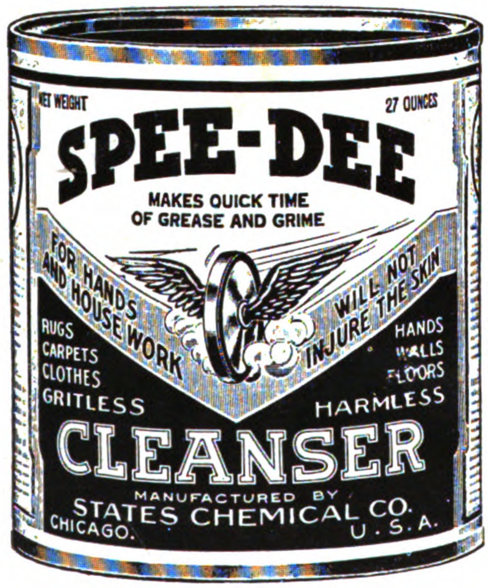

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REGISTERED IN THE U. S. PATENT OFFICE

VOL. XXXII. No. 6 FEBRUARY, 1922 PRICE { 15c per copy $1.50 per year

Repairing Malleable Castings

Axle Housings and Similar Metal Parts Are Mended Only With Difficulty

By David Baxter

WORN, cracked, or broken malleable castings are one kind of automobile parts that are very difficult to repair, even for the oxy-acetylene torch welder, who finds them practically impossible to weld satisfactorily.

Malleable is one kind of metal that will not respond to the power of the welding flame. In fact the welding flame destroys the best quality of malleable iron, the moment it has melted more than the very thinnest skin of the surface. For when malleable is remelted it changes to a white, brittle metal, lacking in strength and devoid of machineable qualities. It is often porous or filled with pin holes after it has been melted. The more of a malleable casting that is melted the less will be its strength as a whole. But even a very narrow weld will render the casting practically worthless in comparison with its original strength.

This looks like a hopeless case for the oxy-acetylene torch operator. It is doubly bad, because so many auto, truck and tractor castings are now being made of this peculiar metal. But let him not give up hope entirely for there is a method of repairing malleable with the torch that is almost as good as fusion welding. In some instances it may even be preferable to welding. At least it is easier to do and does not require as many preparations as would a job of welding of the same size.

Is Really a Brazing Method

This method is nothing more or less than an old fashioned process called "brazing." Old fashioned as to its invention but modern as to execution by a gas welder. And the gas welder is the logical one to do this class of work. Besides being able to do it where other apparatus is impractical the torch operator can braze scientifically and easily. The process is similar to welding and therefore the welding operator can learn to do it quite easily. It is the same as welding only in the adjustment of the torch flame, however, although the melting and depositing of the filler metal resembles the art of welding somewhat.

Brazing is not fusion welding because the parts to be brazed are not melted and mixed with the filler metal. In fact, as a general rule, even the surface of the broken parts is not melted. Some welders do bring the surface to a melting stage but this is only a very thin skin of the surface metal. Other welders bring the surface to a very bright heat before applying the brazing filler but this is still below the melting stage. Still other operators apply the filler when the surface is only medium bright.

Either procedure seems to give satisfactory results according to the way the flame and filler are handled. To have the surface glowing brightly without melting is no doubt the best recommended method. It would seem that the molten filler adheres to the broken parts better under this condition.

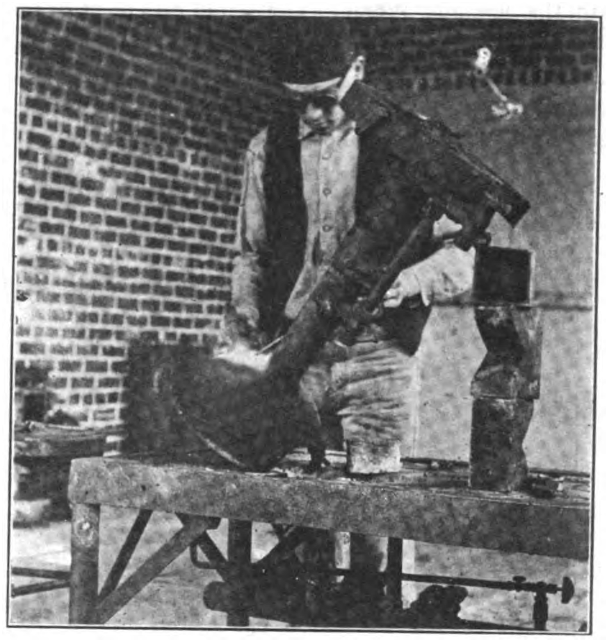

Fig. 1. Tilt the Casting Enough To Bring the Grooved Crack Uppermost.

Brazing, then, is a mere adhesion and is not in any sense a weld because the two metals do not mix. It is easily deduced from this that brazing is the proper method of repairing worn, cracked, or broken malleable castings. Even the surface of the malleable does not need to be melted and therefore the change to brittle white iron is entirely eliminated. The brazing metal is adhered to only the surface of the malleable casting and cannot weaken

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it by changing it to brittle iron, as is done in fusion welding.

The brazing metal will adhere to steel equally well, which is another advantage to the garage torch operator, because many, in fact most malleable iron auto castings, are joined to steel. In other words, malleable and steel are usually used in the construction of certain auto parts.

Take for instance, the rear axle housing shown in the pictures. Many of these parts are constructed by attaching malleable castings to steel tubings. When fractured the damage usually occurs at the point where the steel tube enters the malleable casting at either end of the tube. But let us see how a job like this is sometimes handled in relation to the brazing process.

In Fig. 1, the large bell-shape casting which formed half of the gear housing, was almost cracked in two, nearly half way round on the shoulder not far from the neck part that joined the tube. This crack was about five inches long, through metal about three-eighths of an inch thick, a thickness that required grooving to make the best job. The crack was cut out with a diamond point chisel the full depth until it formed a wide groove, the walls of which sloped enough to make the groove twice as wide at the top as the metal thickness of the casting at this point.

Cleaning with the Flame

Then the grease and paint were burned to a cinder with the welding flame. This cinder deposit was then scraped with a file until the bright, bare, metal was exposed. This cleaning included about an inch of the casting surface on each side of the grooved crack, the full length of it. By burning and scraping off the grease it

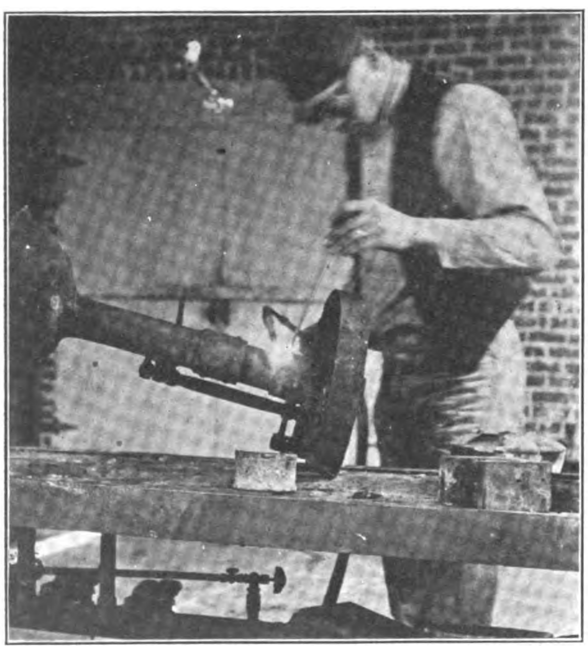

Fig. 2. The Casting is Rolled Over as the Filet of Brazing Metal in Melted Around the Tube.

was prevented from interfering with the brazing process. By grooving the crack, the operator was furnished more surface to which he could adhere the brazing metal, and thereby make a stronger bond.

This bell-shaped part of the housing was made of steel, however, and could have been welded with steel or wrought iron filler instead of brazing the crack. But brazing was more convenient and made a bond almost as strong. In fact this job was a good example of where brazing may be applied instead of the welding process; in other words the brazing of steel alone. Other examples of brazing are steel and malleable, and malleable alone.

To braze this job the casting was placed upon the welding table after grooving. Here it was tipped about as shown in the picture. This position brought about half of the grooved crack in a nearly horizontal position. This was necessary because molten bronze has but little surface tenacity; it is very fluid when molten and will tend to overflow the groove or run along it to cover portions not ready to receive it. In a horizontal position the metal is more easily controlled or guided by the force of the welding flame. In the case at hand, as the groove was filled the casting was turned to keep the melting filler level.

Concentrating the Heat

The flame was then lighted and adjusted neutral before applying it to the groove. When burning properly the flame was brought in contact with the groove to pass slowly along, heating the casting metal red hot. At the upper end of the groove the flame was concentrated upon about an inch of it. As the flame swung back and forth along this spot the steel commenced to turn red and then changed to a bright red. While this was happening the brazing rod was held closer to the flame in order that it might be ready when the surface of the groove was at the proper stage of heat. The moment the first inch of the groove was bright red, but not yet starting to melt, the filler rod was brought in contact with the casting, melted down and spread over the entire groove. The flame pressure and twisting movement of the rod served to place the brazing metal exactly where wanted. The groove was overfilled and firmly adhered along the edge upon the casting surface.

At the same time the process was gradually moving along the groove to heat and fill or cover another inch of it. Meanwhile the brazing rod was dipped again in the flux powder to deposit a pinch of it upon the melting filler. As the second inch was completed the casting was turned a little and the work proceeded as before: heating the surface bright red; fluxing the rod; melting the groove full of bronze; flattening and rounding it over with the force of the flame. Thus the entire crack was filled in a series of inch sections, each of which was but a continuation of the preceding one.

A Second Example of Brazing

The next example, that of brazing steel and malleable together is shown in Fig. 2. This is the same part of a rear axle housing but the fracture was located in and near the malleable brake rigging casting. That is the loose casting on the steel tubing and was split back a few inches from where the tube entered it. This made the job one of brazing cracked casting and fastening it to the tube with brazing metal.

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First, the crack was grooved out about like the other job. Then the old rivets were cut off and removed. All parts to be brazed were cleaned bright and bare, including the rivet holes and the surface surrounding them. Then the casting was tilted as shown in Fig. 2, arranged to roll across the table so the operator could keep the brazing level.

After taking care that the alignment was correct, the operator applied the neutral welding flame to the inner end of the crack in the hub of the casting. Here the procedure of heating the groove bright red hot and filling it with bronze was carried out, the same as described above. The entire crack was filled a little at a time, well fluxed and rounded over with surplus metal filler.

Then a filet of bronze was deposited around the end of the malleable casting, binding it and the steel tube firmly together. As each inch of this filet was completed, the casting was rolled sidewise to bring another inch of the crack upward. Neither the steel nor the malleable were heated to a molten state before adding the bronze, but were covered with it as soon as the portion to be brazed reached the bright red stage.

Depositing the Filet

In depositing the filet, the same as filling the groove, the flame and filler rod were kept in almost continuous movement. The flame advanced, retarded, and revolved, according to the need of the melting. When the metals appeared to be getting too hot the flame was drawn back, and vice versa. When a larger heated surface was needed, the flame was held close and revolved in larger circles. The filler rod was kept twisting and sawing while in contact with the molten bath, feeding it here and there as needed. This does not mean that the brazing was a series of jerks and twists but that the torch and rod were moved in unison to obtain the best possible results.

At times the flame was turned sidewise to strike the work at an angle instead of directly into the melting metal. At times the filler was held at a wide angle and at times was drilled straight into the bath, all depending upon the reaction of the metals under the flame.

Filling the Rivet Holes

After this filet of bronze was complete around the tube and casting, the operator attacked the rivet holes. The metal within and around these was heated bright red the same as the other jobs. Then they were quickly filled to overflowing with bronze well churned into the holes. One after the other the rivet holes were brazed as fast as the work could be accomplished. Plenty of flux was used at the start and throughout the brazing of these holes to keep the bronze free from oxide, and to make it more fluid. But before filling the holes, arrangements had been made to prevent the molten metal from leaking out at the bottom. The filling of the rivet holes with brazing metal added considerably to the strength and rigidity of the whole housing. It was a great deal better than leaving the old rivets in place, even with a filet of bronze around them.

No attention was paid to the cooling of these jobs, such as is so essential on welding. There was no danger of cracking through unequal strains of expansion and contraction. As soon as the brazing was completed each job was ready for service again. This is another distinct advantage in brazing over the welding process because the work may often be done without dismantling the car, or without taking the different apparatus apart.

The last example, illustrated in Fig. 3, was a strictly malleable job. This picture shows the torch operator building up a worn lug on a malleable casting belonging to part of an automobile break-gear. This lug was worn

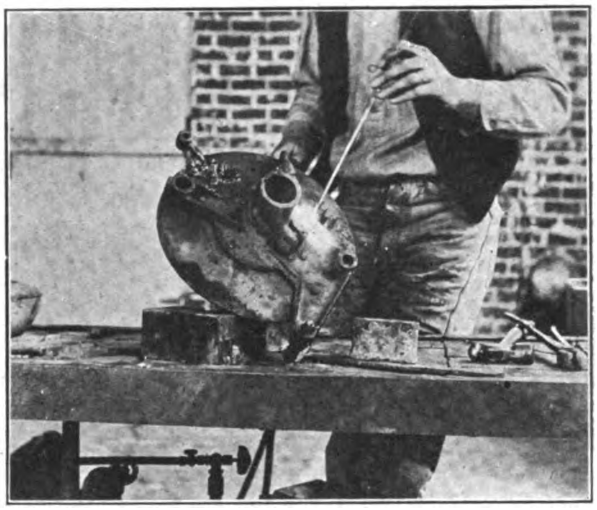

Fig. 3. Building Up a Worn Brace Rod Lug.

practically in two, until it was dangerous to retain it. If it could not have been repaired by brazing it would have meant the discarding of the whole casting and probably the rest of the rigging attached to it. To build up the lug by welding would result only in a weak bond, which would be liable to break any moment, and there was no other way to repair it besides brazing.

Therefore the casting was taken to the welding table where it was placed in the tilting position indicated in figure 3. This position was such that the worn lug would be uppermost and practically level. So the welder could build the new lug up straight. Where considerable bronze is melted and piled up squarely it is very essential to have the foundation horizontal, else the molten metal will topple over or slide to the low side. Even then the metal should be built up in rather thin layers, allowing each layer to partially set or congeal before adding more filler.

Some welders resort to the device of turning the torch upside down and holding it in such way that the pressure of it tends to keep the metal from sliding. But this requires expert torch manipulation and ought to be resorted to only when it is not possible to arrange the casting so the worn part is level. When brazing such things as torn fenders, where the damage is vertical it is necessary to employ some such device as pointing the force of the flame upward along the seam.

After this brake casting was arranged as indicated, the welder applied the neutral flame to the worn part, bringing a portion of the surface to the bright red condition and adding a layer of bronze to it. Then the flame was

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moved to an adjoining spot, where more filler was added, and so on until the root of the lug was covered with a layer of bronze. Then the top of this first layer was covered with another a little less thick. This second layer, however, was thoroughly fused with the first, not merely adhered to it like the first layer was adhered to the casting. Each succeeding layer was also fused with its preceding one, until the lug was built up its proper shape and size.

In executing this fusion a soaking heat, or one where the flame is held farther back, was employed, to prevent the metal from burning. Liberal applications of flux powder were also used to ward off oxidization, since this reaction would be as harmful to the brazing metal as it would be to the filler metal in any welding job.

Perhaps some day some enterprising welder will discover a method of treating welded malleable to restore its toughness, but until that time all malleable jobs should be repaired by brazing. Wherever it does not interfere with the working of the casting a reinforcement may be added along the crack in the form of surplus filler in order to add strength to the bond.

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The answer is, "We can, but we won't." Now, the first car the writer ever rode in was a 10 H. P. Maxwell and that was the first car he ever owned. It was a two-cylinder affair but the demonstrator made the trip up Broadway and the Drive at as fast a clip as the law allowed. And, except for carburetion difficulties incident to the poorer grade of gasoline, a similar car could go over the same route to-day at the same rate as did that car of twelve years ago.

Weight and speed are the two chief factors that have brought about an increase in engine size. Barring the one difficulty mentioned, the two cylinder Maxwell would go further and faster in all around present day service than it did a decade ago, for the simple reasons that the roads are smoother and grades cut down and a vastly increased percentage of roads and streets are now improved.

He Would Balk at the Style

But the humblest buyer of a first car to-day would balk at that type of car. "Why, it's only got two cylinders and a two speed transmission and you can't get more than eighteen miles an hour out of the thing on a level. I want a car that will go and I want something more than two oil lights on it, too. And what are you going to do if it rains? It hasn't got any top. Then, it hasn't got a starter and it's an open body without fore doors and there's only just the one brake on it and it's got one of the cheap circulating systems without pumps for oil or water. No, I wouldn't have that car on a bet—I want something besides the skeleton."

And that is just why we have to have those big engines —it takes power to move weight and it takes power to keep up a speed. All of the embellishments that early car lacked have added to its weight—yes, have doubled it; and while we have been adding weight, our ideas of speed have grown a hundred per cent—if mechanical perfection and our system of roads hadn't advanced at an equal rate, we might now find ourselves using engines of 40 H. P. on our Fords, and other cars in proportion.

The English common folk are content to jog along at ten or fifteen over their perfect roads and they are willing to forego some luxuries on cars to save in gasoline. So are some of the people of the Continent and that is why the European "production" cars that find their way to our Shows have such ridiculously small engines under the hood.

Where the Fuel Goes

The gasoline we use is fed to the engine and this hungry beast of burden develops its power, then expends it, in overcoming the resistances that the manufacturer has created for it and that we impose for our pleasure or in our folly. These resistances are

Friction
Gear Losses,
Front End Resistance,
Speed,
Grades,
Road Resistances,
Wind,
Loads (weight).

Friction

Friction is present in all machinery. Wherever there are parts rolling or sliding or turning, there is friction. Piston, shafts, gear teeth rubbing, bearing—there is friction at all of these points. Engineers have stated that it takes 4 H. P. to keep the average American car rollling

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on a level; this is, of course, an approximation but it points to the truth.

Friction increases with an increase of load. For instance, a piece of board may be shoved along the floor by a child but let two people stand on that board and a strong man cannot move it. Applied to the car, this principle enables us to comprehend why there is more friction in bearings when the engine is moving the loaded car than when the same parts are being moved by the hand crank, with the lever in high and a rear wheel jacked up.

If the perpendicular pressure on a bearing is known, the amount of resistance to moving created by that pressure can be figured quite closely—for a well lubricated babbitt bearing, the frictional resistance would be from 10 per cent to 1 per cent of the pressure, for a ball bearing it would vary from one per cent to 1/10 per cent according to the design and speed of revolution. If the area of a piston head is 9 square inches and the compression is 60 pounds per square inch, then there will be a pressure on the wrist pin and the crank pin of 540 pounds (for a moment, at least) and it will take 54 pounds or more at each point to overcome the friction.

Frictional Losses in Brakes

Brake bands may drag, thrust adjustments be made too tight, bearings so loose that the parts drag against stationary members, bearings set up too tight—all these things create friction and this friction the engine has to overcome. A man drew up one noon and said his car didn't have any power; the engine seemed to run all right so we suspected friction somewhere—and found it when one rear wheel was jacked up and was discovered so tight you couldn't move it by hand.

Gears

Gear losses are friction losses too. The gear teeth roll against each other and, as there is considerable load transmitted at times, the friction mounts up. The S. A. E. bulletins state the loss as 0.9 H. P. for each gear with plain bearings. Bearing losses form a part of "gear losses" because the shape of teeth naturally tend to make each gear in a pair separate from the other and this throws a load on the nearest bearing.

Front End Resistance

Front end resistance is the resistance to motion that air offers. It increases as the square of the speed in miles per hour—this showing why a person who wouldn't think of goggles for riding about town finds them imperative when they get out where there are no restrictions to speed. This resistance is less for a heavy car than a light one of the same "projected area," which is the area of the cross section of the car as viewed from the front. Also, the greater the projected area, the greater the resistance because more air must be moved out of the way to let the car pass; for this reason, a car with the top up requires more power to go at a certain speed than one without any top or wind shield.

A Ford car running at 20 miles an hour with top up has to overcome a resistance of about 20 pounds.

The Wind

Wind pressure is very similar to front end resistance, though it may act in any direction and, according to the direction of the wind, it adds to or subtracts from the resistances the engine has to overcome. The chances are three to one, though, that wind will be a resistance. Sometimes the wind blows directly against the side of the car, when the thrust bearings in the wheels have to take the load and wind resistance is transferred into friction losses in bearings. At 10 miles per hour velocity, the wind pressure on a vertical surface is ½ lb. per sq. foot—at 20 miles per hour, it is 1½ lbs.—at 30 miles per hour, it is 3½ lbs. Thus if the projected area of a car with top up were 30 sq. ft., it would require an additional 10 lbs. of power to move the car in the face of a wind blowing 30 miles an hour.

Speed Resistance

When starting a car, there is no resistance due to speed but, because friction is always greatest at the beginning of motion and the grip of oil has to be broken, the starting resistance is high. When the machine gets to moving, the resistance drops rapidly to a minimum at around six miles an hour, from which point it climbs steadily. This "resistance of speed" is expressed always as so many "pounds per ton of weight."

The writer has always found this speed resistance greater than that given in tables; thus with a new car weighing 2500 pounds, brought in after a run of fifty miles and placed on a smooth, level floor, the resistance to starting was 75 pounds, which dropped off to 16 pounds at six miles an hour. The accepted resistance of such a car, theoretically, would be given as about 10 pounds to start and 4 pounds at 6 M. P. H.

Grades

Going up a grade is just the same as lifting the car vertically the distance from bottom to top. The resistance due to grades is in addition to the internal resistance and wind, speed, etc. Speaking of grades in per cent, it requires 20 pounds pull to move a ton up each per cent in the grade; thus on a 1 per cent grade, the engine has 20 pounds more resistance added to its load for each ton the car weighs, on a 5 per cent grade it has 100 pounds. How fast or how slow the car ascends has nothing to do with grade resistance, *that* is taken care of under the resistance of speed.

Road Resistance

It might be said that road resistances were of two kinds—those due to the hardness (or smoothness) of the road surface and those where the wheels have to mount obstacles, in themselves miniature grades. Sifted down, all of these become miniature grades.

When a wheel drops in a hole, it has to climb a very steep grade to get out; in sand, the grade packs itself

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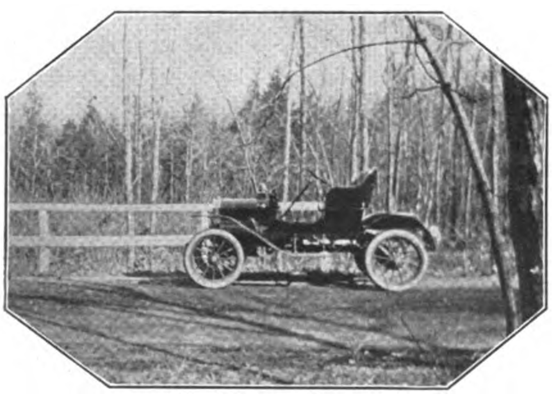
up in front of the wheels as far as the stretch exists; on rough pavement, the inequalities are a series of hills that have to be surmounted. Each is a condition by itself but they have been classified generally and compared to the "pounds per ton" scale so that we know that there is 20 pounds resistance on asphalt, 50 pounds on hard gravel, 100 pounds on ordinary clay roads, and 300 pounds plowing through sand four inches deep. That gives a very fair idea of why a car runs easier on some roads and so "heavy" on others. Off of pavements and improved highways, road resistance becomes the greatest of the list unless grades are encountered.

And Weight

It takes more power to move two tons than it does to move one ton—just twice as much, other things being equal. So if you crowd seven people into your Ford or put an extra ton load on your 1½ ton truck, you know exactly why the machine pulls harder than when loaded as the maker intended it to be. I know one man who changed the gear ratio to make the truck run one-fifth faster, then he put on a body twice as heavy as the maker's allowance called for, and he carries a paying load that often runs 150 per cent greater than the truck was built for; still he claims that "these trucks won't stand up."

From the above recital, we get a good idea of what the poor engine is up against. If we ever reach that state of mind where we are willing to divest our car of superfluities and get back to bare car again, resistances will be so



reduced that we can run our two cylinder Maxwells and save money by so doing. Meanwhile, those who wish to economize must study their resistances and govern their practice accordingly.

LUCKY DOG

"The only friend Withers has in the whole wide world is his dog."

"Yes, and it is beginning to tell on him."

"What, on Withers?"

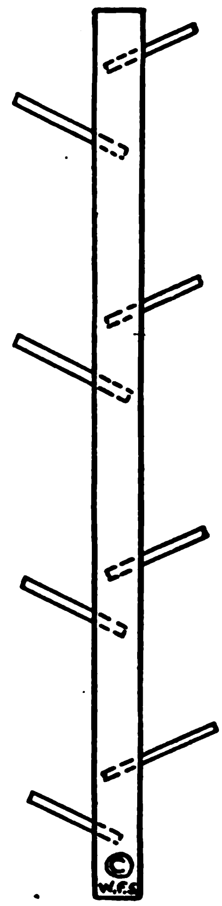
"No, on his dog."—*Life.*

AN EXCELLENT RACK FOR HEAVY MATERIALS

W. F. Schaphorst

HERE is an excellent and very simple rack of pipe, strap iron, bar iron, wood, or other heavy materials. No nails or screws are required whatever, and it is very strong. Those who have ever tried to make pipe racks for heavy materials out of nailed or screwed cleats,

At the Right Is Shown the Construction of the Rack Designed for Holding Bars of Iron or Similar Things Usually Kept In Stock in a Well Equipped Repair Shop.



brackets, wooden bars, etc., will appreciate this very simple design.

To make this rack, simply bore holes into four inch by four inch timbers, or timbers of other suitable size, two or more, at a slight angle, as idicated in the drawing. Make the holes "just large enough" so that short pipe lengths can be driven in easily.

By inserting pipes on both sides of the posts the entire stand can be perfectly balanced, eliminating the danger of pulling walls over, as has frequently occurred due to eccentric loading. But with this rack, even if unbalanced, the top of the beam can be fastened in such a way that there will be absolutely no danger of its falling over.

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WALLPAPER SALESMAN: Something quiet and soothing, I suppose?

CUSTOMER: No, something loud and irritating—it's for the guest chamber.—*Life.*

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The Modern Hardening of Steel

Science Has Progressed to Such a Point That Steel Working Is Not All Guesswork

By J. F. Springer

(Continued from last month)

CARE should be taken to prevent the work from coming into actual contact with the metal sides or bottom of the pot or tub holding the bath. It may often be convenient to suspend the articles by wire.

The bath method is especially useful where the article is to be hardened *all the way through* its interior. It may be left in the bath until it is certain that there is one temperature outside and inside. When heating at an ordinary forge, the exterior must, pretty generally, be hotter than the interior. Perhaps it is much hotter. Consequently, if the work is to be hardened all the way through, the metal may have to be heated too much on the outside in order to make sure of the inside.

When this steel is plunged into the water or the oil, hardening will take place all through, but the exterior will be steel that is more or less damaged, because of the excess heat. Of course, the metal may be hardened when the exterior shows just the right temperature, but that may leave the interior absolutely unhardened. This difficulty of securing a hardening heat all the way through without overheating the outside occurs in connection with the way the heating is done and not so much with the way the temperature is determined.

Temperature and Color

When one looks at a heated piece of steel and decides upon the temperature by means of the color, he doesn't see inside. The metal isn't transparent when it is hot. One has to guess, using his judgment as best he may. Similarly, when using the magnetic method, the magnet will not cling to the exterior after a certain heat has been reached. But perhaps it would, if it could get into contact with it. So, then, the hores-shoe magnet is no guide as to the inside.

However, the magnetic needle, carefully balanced, may serve at this point, for the reason that it does not require actual contact, but is affected by the close neighborhood of metal not hot enough to lose its magnetic quality. We have here a reason for preferring the magnetic need—in the form, say, of a pocket compass—to both the horse-shoe magnet and to the colors, where one wants to get at the interior temperature.

I come now to a combination method which I have never been suggested anywhere and which I now bring forth for the first time. The balanced magnetic needle appears to have this defect: It will probably indicate the moment when the inside metal has gotten hot enough to lose its magnetic quality, even though the outside metal has gone up to higher points. The result is apt to be that the outside will get overheated in this way and be in consequence more or less damaged. Now, the horse-shoe magnet acts in the reverse way.

It notifies the workman that the outside is about hot enough to plunge, but says nothing about the inside. My idea is to combine the two. I am setting the method forth for exactly whatever it may prove to be worth. So far as I know, it has never been tried out. There may be some practical difficulty which I do not see at the moment and which would seriously interfere with success. The method promises to be a good one. Try it, but do not depend upon it, until you or some one else has proven it.

Use Both Magnet and Compass

I suggest, then, in heating up steel for hardening, that the horse-shoe magnet be depended upon until it refuses to cling. This should indicate that the *exterior* is nearly ready for plunging. When the horse-shoe magnet has refused to cling, put it aside where it will not interfere with the compass. Then, use the compass to determine when the *inside* is hot enough. It is pretty important not to have masses of steel and iron in the neighborhood of the compass as they tend to derange its action.

If there is any substantial period required to get the needle to be unaffected after the horse-shoe magnet has been laid aside, the workman is to judge, from the conditions at the time, whether this substantial delay means any substantial overheating of the outside or whether it signifies only that time must be allowed for the heat to penetrate.

For example, if the delay occurs when the heating is being done at an ordinary open forge, then it probably means that the outside is overheated in getting the interior up to the proper point. On the other hand, suppose this case. Suppose that a molten mixture of common salt and potassium chloride is being used and that it is known that the temperature of the bath is right. In a case like this, the interval of time between the indications that the outside and the inside have lost their magnetic qualities would indicate that the article had not been in the bath long and that time had been required for the penetration of heat to the inside.

Various Methods of Heating

But it will not in all cases be convenient to provide a salt and potassium chloride bath or any similar one. There are, fortunately, alternative methods.

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A closed furnace supplied with up-to-date means for its automatic regulation as to temperature is, if it also maintains a uniform temperature throughout the heating chamber, just the thing. But they are more or less expensive.

Another method relies on the *slowness* with which the ordinary furnace may sometimes be operated in the final heating. One or two furnaces may be used. If two are employed, the one may heat, more or less rapidly, during the first part of the heating process; and the second during the latter part. A single furnace may often be operated rapidly for a time and then very slowly.

The idea in the slow operation is to give time for the heat to pass from the exterior to the interior of the work. If the furnace has been heating up very slowly for awhile the inside of the work will be nearly as hot as the outside. Consequently, when the outside is just hot enough for plunging, a few moments more will bring the inside to the same point. Slow operation at the finish is the thing for shops that cannot install the modern apparatus.

Slow Heating at the Finish

It is important to know what is meant by "slow operation." The idea here is to push the temperature of the work up slowly. It is pretty hard to keep an ordinary furnace at one temeprature for a considerable time. It will be heating up higher and higher or cooling off more or less or fluctuating between up and down. So also with the work in the heating compartment. *"Slow operation" will be obtained when the work heats up little by little.*

With the exercise of good judgment, it ought to be quite practicable to get fine results by attending to this matter of slow heating up at the finish. The principal heating may then be done in almost any manner. For example, if it is desired to plunge a piece of steel of 0.95 per cent carbon at a temperature of, say 1300 degrees, F., the workman may proceed as follows:

The heat wanted is a medium cherry red or a trifle higher, but dependence is, upon this occasion, not going to be put upon color to determine the moment for plunging. The work may first be heated in the ordinary forge, the workman turning it round and round to even up the heat as much as possible. It will be permissible to do this until, say, the moment when the first dull color begins to show.

The Quenching Temperature

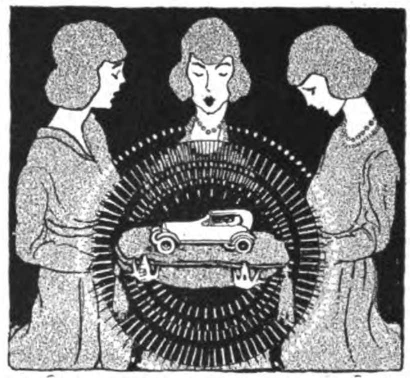
The work is then given the slow heating up to the required point. That point may be determined by the horse-shoe magnet or the pocket compass. When either shows that the magnetic quality has been lost, the slow heating is continued for a little to get the work up a trifle higher—that is from 1274 to 1300 degrees, F. If the quenching tub is not very near at hand, it may be necessary to go a trifle higher yet, in order to allow for the loss of heat in taking the work to the tub.

LADIES AS AUTOMOBILE OWNERS

By Cora A. Anderson

THERE are three ladies in our family and we have run a car for eighteen months with very little cost except for gas and oil. People are prone to think that when machinery enters into the question, it always takes a man to make the wheels go round." We have exploded this theory for, although many prophesied that we would have all kinds of trouble as a result of our utter lack of mechanical knowledge, we have proved that "ignorance is bliss, where 'tis folly to be wise."

Of course, we take our car to a reliable garage (yes, we know of a reliable one) regularly and have it greased up and looked over completely to see if trouble is brewing anywhere. Otherwise, the hood is never open unless the engine stops and cannot be induced for the time being to resume work. Then we *do* have to sit still and look helpless until some chivalrous fellow-traveler comes to our rescue.



The very fact that we do not open the hood and "monkey around" I believe to be the secret of the good service we get. Now, a man, with only a love for machinery, but with no technical knowledge, would be continually readjusting and experimenting with the works in his car, but we let ours alone. He might know a little more than we do, but he does not know enough to keep away from the inside works, thus upholding Alexander Pope's charge that "a little learning is a dangerous thing."

The mechanism of a man's car satisfies all of his longing to experiment with machinery and thus a mere amateur works on the average automobile almost continually while we, being women, realize our limitations and, of a necessity, take ours to the garage where only experts touch it.

Likewise, we have our tires examined before they puncture, instead of afterwards, and not only save ourselves trouble and embarrassment, but actual expense. In every respect, we have found that when it comes to automobiles, "an ounce of prevention is worth a pound of cure," and usually an ounce of prevention direct from the garage is worth a ton of fake cures by the men owners.

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Helpful Hints for the Garageman

Big Jobs Which May Be Done in Shops Equipped With Only Small Tools

By M. I. Cochran

A REPAIR shop in a garage is never expected to be as pretentious as a regular machine shop, with the result that on many occasions, some job will come along that looks too big for the shop. This holds especially true, if a big part to be turned comes along, which may look too large for the small lathe to accomplish. Sketch number one shows how to get over such a difficulty. Never mind if the tool post won't back up far enough; see first of all if the work will just clear the ways of the lathe. If it will you can turn it. Even if it does not you can block up the headstock of the lathe until the work does clear, then proceed as shown in the sketch.

The Special Tool Holder

Back the saddle and tool post entirely out of the way, then place on the ways of the lathe, the makeshift turning rig shown. The piece A is a piece of round steel from four to five inches long. In this is a tool B, also a rod C, which in turn is fastened to another piece of steel D, the same length as part A. The bolt E, and clamp F, completes the rigging. Tightening the bolt E, just enough to hold the fixture snugly to the ways of the lathe you proceed to turn the piece on the lathe.

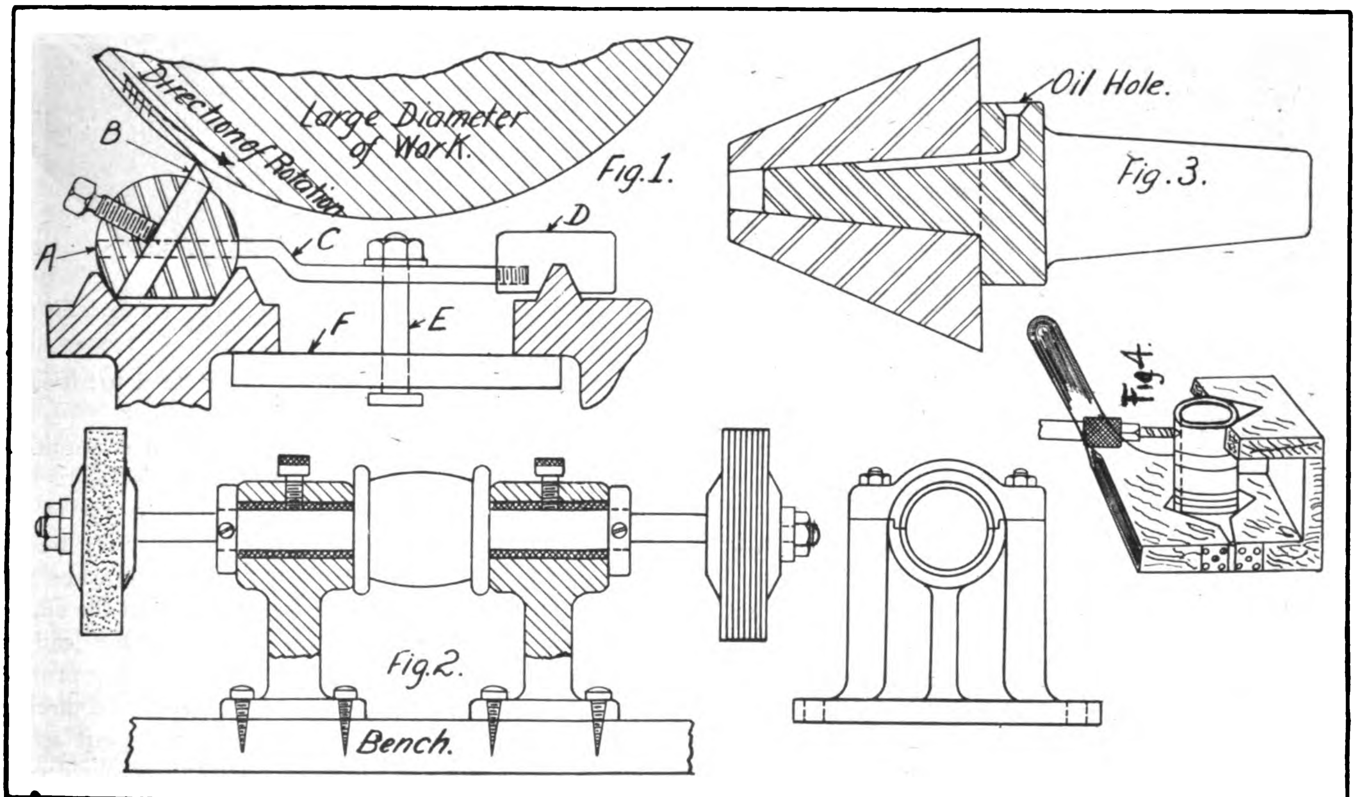
Placing the saddle up against the one end of the pieces A and D, you start the machine and at the same time throw in whatever feed you want on the saddle. The result is that the tool B, is pushed along and turns the work as good as if the regular tool post was used.

A Home Made Grinder

In many cases a garagemen does not wish to go to the expense of a grinding machine, and yet he needs one. Here is how to make one at very little cost. Purchase from any supply house two bearings as shown in sketch A, Fig. 2. This will not cost much. Fasten these to the bench as shown at B, Fig. 2; take a piece of cold rolled steel and turn it in the manner shown on sketch; turn up a pulley from any old block of cast iron, and you have the grinder complete with the exception of the two thrust washers and the emery wheel. On one end you can put an emery wheel, and on the other a buffing wheel, so that you can both grind and polish on the one machine. Making a grinder this way will save a garageman quite a bit of money.

Self Oiling Center

The next idea, Fig. 3, is very simple but mighty useful, and not as well known as it should be. Quite often, a large false center has to be used when turning hollow work, and the oiling of that center is a continual source of annoyance. By making one of the design shown, the oil



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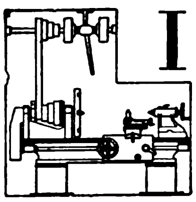
goes directly through the hole, on to the stem and in this way eliminates all the trouble.

The last scheme, Fig. 4, shows a cheap form of clamp which can be made out of wood, and an ordinary hinge. It will hold all sorts of round work, and will be found invaluable around the drill press. By adopting these ideas, garagemen can speed up their work with scarcely any added cost.

Automobile Storage Batteries

The Third of a Series of Articles Dealing With the Construction of Accumulators

By Sidney F. Walker, R. R. N.



IN THE lead battery dilute sulphuric acid is the electrolyte, and there are very peculiar chemical and physical actions going on during charge and discharge, changing the nature of the electrolyte. During charge as explained the current enters at the anode, the lead grid carrying the high oxide; it passes from the lead grid to the liquid carried in the pores of the oxide, and thence to the liquid in which the plates are immersed; it passes from the body of the liquid to that which is contained in the pores of the low oxide and thence to the lead grid, the cathode, carrying the low oxide, and thence back to the charging dynamo.

The Chemical Changes

At the anode, oxygen is taken up from the liquid to enable the high oxide to become the higher oxide, and at the cathode hydrogen is delivered, which seizes upon some of the oxygen of the low oxide, forming water, the low oxide being converted into spongy lead. The liquid itself increases its specific gravity during the charging process, and one of the methods of testing for charge is by means of a hydrometer. The specific gravity of the electrolyte solution before charging may be around 1.125, and during charge it increases from 1.285 to 1.300. During discharge the reverse operations take place, current now flows to the outer circuit from what was the anode, the grid at which the charging current enters. The battery now acts exactly as a primary battery would do, but with lead immersed in sulphuric acid instead of zinc in salammoniac or any other liquid.

The spongy lead on what was the cathode during the charging period now combines with some of the oxygen of the water, and some of the acid radical as it is called, the chemical nomenclature of which is SO_4 to form oxide of lead, and sulphate of lead; it is this combination which furnishes the current, just as the combination of carbon with oxygen in a boiler furnace gives rise to heat.

As in the primary battery, the current passes through the electrolyte the body of the liquid, and delivers the hydrogen at what was the anode, but which is now the positive plate of the battery; the plate from which the current flows to the outer circuit. The hydrogen liberated at the anode reduces some of the higher oxide; it should reduce all that has been raised to a higher oxide during the charging period if the operation has been carried out correctly; and the active material returns to the state in which it was before the charging current passed through the battery.

It will be understood that the whole of the high oxide and the low oxide carried by the grids do not take part in the action during each charge and discharge; a certain portion of the oxide upon each of the grids takes part in the action, the portion being that which the charging current is able to handle, and the discharging current handles a little less usually than the charging current.

What Has To Be Looked Out For

One of the things that has to be looked out for especially in the lead battery, is the prevention of the deposit of sulphate of lead on either of the carrier grids or over the active material. Sulphate of lead is a white substance; it forms a powder when dry, and it has a very high electrical resistance compared with either of the oxides of lead or the spongy lead referred to; it is also denser, its particles lie more closely together.

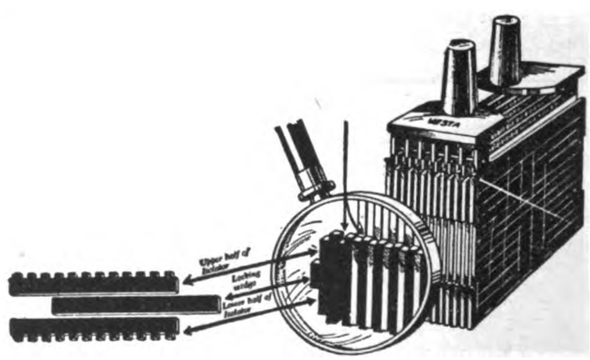


Fig. 1 A Group of Plates Showing Relation to Each Other and the Construction of the Separators.

If a lead battery is not charged when it is required as explained below, or if it is allowed to discharge below a certain pressure per cell, lead sulphate is apt to form as a thin deposit between the grid and the active material.

The manner of sulphate formation appears to be somewhat doubtful, there are several theories on the subject; but one possible source is the contact of the lead grid with the sulphuric acid, when the battery is not protected by charging current or a properly proportioned discharging current. If a battery for instance is left without charge for some time, sulphate of lead is formed on the

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surfaces of the grid, between the oxide and the lead. There is a capillary space between the two, which is of course filled with dilute acid; the presence of the acid is necessary there as explained to carry the current to and from the lead grid; but if no current is flowing the lead grid begins to combine with the sulphuric acid and form the sulphate on its own account so to speak, and the capillary space between the lead grid and the oxide is gradually filled up by sulphate.

The matter does not stop there either; as the dilute acid is present in the pores of the oxide, the sulphate gradually finds its way into them. Two results follow from this, both of which are of great importance in the working of the battery; the sulphate introduces such a high rèsistance between the oxide and the lead grid, or between the liquid filling the pores in the oxide and the lead grid, that practically no current passes; or at any rate a very much smaller current; and as the sulphate of lead occupies a larger space than the electrolyte, or tries to, it tends to force some of the active material out of the carrier. As will be explained this is one of the many troubles in the working of lead batteries that has to be provided for; it is one of the advantages of the Edison battery that the equivalent action to this cannot occur.

The Breaking Up Of The Active Material

This is one of the most serious questions in connection with the working of the lead storage battery. At its best the active material is in a more or less loose condition; the improvements that have been made in the preparation of the loose materials, the oxides, and in the construction of the carrier electrodes, have lessened the trouble due to this cause very considerably, but it still exists; there is still a tendency, even when the battery is well looked after, not overworked, for small quantities, minute particles of the oxides, and particularly of the higher oxide, to break away from the body of the substance.

Troubles Incident to Shedding

One trouble that results from this shedding is the short circuits that are set up between the plates, and the battery is practically put out of action, all the current either in charging, or discharging goes across the short circuit, no charge can be put into the battery, and any charge that it possessed before the short circuit took place is expended in heating up the bridge forming the short circuit. In the earlier days of the lead battery, bridges were formed between the plates, by an accumulation of small pieces of oxide lodged on projections on the plates themselves, on the grids.

In the early days plates were very apt to buckle during charge, especially if the charging current was generous, and little protuberances were formed, the girds or plates bellied out at parts of their surfaces, and little pieces of the oxide lodging there gradually grew little bridges, and when a bridge was complete a short circuit was formed, and the cell was soon put out of action. In other cases, in those days, lead trees grew out from one plate to the other.

Even after the grids were strengthened as will be explained, and greater care and knowledge was employed during the charging period, the trouble persisted though it took longer to produce short circuits. In place of the particles of oxide, or spongy lead building up a bridge between the plates at some point on the surfaces of the plates themselves, the little particles fell to the bottom of the cell, and gradually grew a bridge there very much stronger and of lower resistance than those described above. The trouble has been met in two ways; all the carriers are now made with feet; and one American Company claims to have decreased the chances of the bridge of oxide building up on the bottom of the cell,

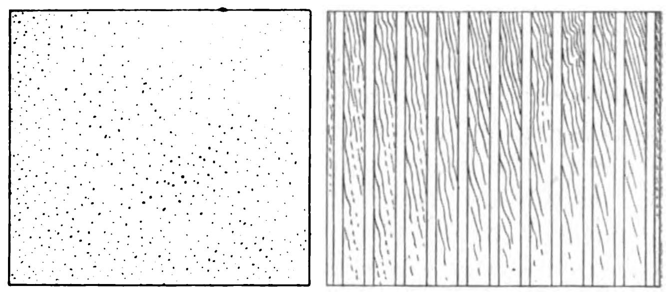

Fig. 2. Front and Back Views of a Typical Wood Separator.

by arranging that alternate plates shall have their feet at opposite ends of the cell, the plates being supported by insulators at the ends away from the feet. The feet, which are shown in some of the illustrations accompanying this series of articles, are cast with two grids, and they enable the plates to stand above the bottoms of the cells, leaving a fairly considerable space between the bottoms of the plates and the bottoms of the cells. This space would of course be filled up in time, but with modern batteries the time required, provided that the cells are properly handled, is sufficient to allow of keeping things right by periodical examination and removal of any deposit that may be present. In most American Batteries the containers are provided with ridges across the bottom for the plates to rest upon.

In all modern batteries also, separators are used between the positive and negative plates. As will be seen from the illustrations when the plates are in position, there is a very small space between the positives and the negatives; that is one of the dangers of course of building up the short circuiting bridge. The separators are very thin plates of hard rubber having a very large number of perforators in them, or special forms of wood, especially treated.

Advantages of Various Types

There is the usual difference of opinion between different makers of storage batteries, as to the relative advantages of perforated hard rubber, and wood. With hard rubber, which is a perfect insulator, so far as the currents employed in these batteries is concerned, the only path for the liquid, and therefore for the charging and discharging currents, is through the perforations in the rubber plates; if these get blocked up, the path for

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the liquid and the current is seriously reduced, and the electrical resistance of the cell is considerably increased.

With the treated wood, the pores of the wood itself are depended upon to form paths for the liquid and the currents. Both the rubber separators and the wood separators are generally made with stiffening ribs, arranged vertically. It will easily be understood that thin hard rubber would be very flexible, and unless it was stiffened by the ribs, it would bend to one plate or the other, and the result might be that small particles of one or other of the oxides would find their way into the perforations. Some of the wood separators are not provided with stiffening ribs, it being thought that they are strong enough to stand by themselves. (Fig. 2 shows a typical wood separator.)

In some batteries, glass wool has been employed as a separator, in place of either hard rubber or wood, and the writer understands it has answered very well indeed. He recently had some very small storage batteries through his hands, designed for flash light lamps, in which glass wool was employed with good results; he also had some others in which fairly thick wooden separators, with strengthening ribs were used, also with good results. In the latter form, the wood had been apparently prepared under pressure, with cavities to take the lead plates.

HOW TIRES WEAR OUT IN THE GARAGE

AN inspection of crippled tires in the collection of any repairman will reveal the fact that a larger percentage of the trouble comes from neglect in the garage at home. If stones, ruts and road roughness were the only things that wore out tires repair bills would be cut in half.

Water, oil, grease and light—rubber's worst enemies—work in a garage more actively than on the road. In washing the car, the rims are liable to become rusty and eat away the tire. A coat of graphite or common stove polish will prevent this and keep the tire from creeping.

Oil or grease should never be allowed to stand on a garage floor. Small cuts or bruises on the tire surface say Miller tire men, should be repaired at once. If a tire has been smeared with grease, it should be washed thoroughly with cold water and a little soap.

The spare tire is often forgotten while the other tires are giving good service, and neglect sometimes causes it to deteriorate rapidly. It should always be protected from rain, sun and dirt by a cover. Once in a while, change it with one of the tires on the car, so that the rubber will not harden from disuse.

The weight of the car should never be left on a deflated tire. Such treatment is as bad as running on a flat tire and is certain to crack the carcass. Jack up the wheel, or take off the tire entirely.—*Miller News Service.*

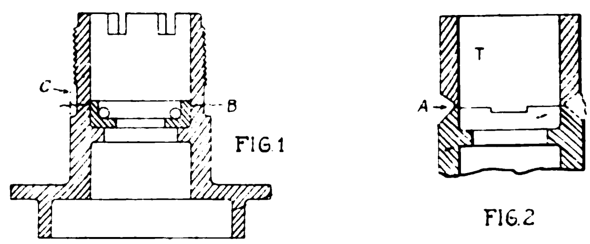
THREE MAJOR REPAIR JOBS

by Dawson A. Hunter

MINOR repairs are everyday occurrences in thousands of garages and hundreds of private workshops. One expects them. But when some major part fails, a part that cannot be duplicated or whose cost nearly approaches the actual value of the car, then the problem of a repair makes the owner "sit up and scratch his head," as old man Hoe used to say.

Fig. 1 is a cross section of the rear wheel hub used on the 1910 Tourist. A casting—years of pounding over poor roads—finally opened up the crack noted at B. The owner saw no reason why he should scrap a perfectly good car just because a hub had broken. So he wrote several manufacturers and wreckers, but to no avail though the Puritan Machine Co. had junked a number of these hubs a short time before, not having received an order in five years.

Nothing daunted, our friend secured a piece of seamless steel tubing with a thicker wall and hied himself to a machine shop to get his rejuvenation scheme executed



Sketches Showing How the Hub was Repaired.

according to the plan he had conceived. The first act was to break the outer end of the old hub off entirely; then to face off the ragged edge of the inner end in a lathe and bevel it for welding purposes. This is shown at A in Fig. 2, which shows also one of four shallow notches machined in the new edge to fit mating notches cut in one end of the piece of steel tube. The tube also was beveled on this end. So far as taking the driving torque is concerned, the repair might have stopped right there for the notches in effect are four big keys and sufficiently strong to move the car.

The inside of the tube having been made the same as on the old part, a discarded bearing cup was dropped into the position shown at Fig. 1 to retain the two members concentric during welding. Following a careful welding job, the hub was taken to the lathe for finishing.

First the inside of the outer end was bored to a permissible slight clearance—and this released the bearing cone. Then the outside diameter was turned and threaded to fit the hub cap. In doing this turning, however, they profited by experience and did not cut the clearance beyond the thread where the hub had once

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cracked; instead, that part was left full size as shown dotted at C, increasing the sectional area and retaining the full strength of the weld.

Finally the notches were cut in the end for the driving lugs on the axle. The entire job cost $14.56 and the proud owner figures that his Tourist is now good for another decade, while we must agree with him that his idea made a good repair out of a doubtful job.

ONE of the cars that has come out of Dixieland, to be orphaned a few years later, fell into the hands of our friend, Tony Salliva, the shoemaker. Tony was of a mechanical nature, like so many of his countrymen, and he took the rear end apart one Sunday to find out why it was so noisy. He found out about 4 p. m. and what he found has given a good many owners a sick feeling in the pit of the stomach under similar circumstances.

What he found was the differential carrier cracked off in the neck back of the gear—cracked along the line X-Y in Fig. 3. A good many carriers have failed at this point from lack of thickness in the casting design. No sane person would do else than scrap such a piece, even if it did mean waiting six weeks for a new one, but Tony could "maka shoe lika new" and he saw no reason why the same didn't apply to the auto business.

Accordingly we effected the repair shown by the drawing—and a good one it was too—guaranteed stronger than the original. The carrier, C C in the drawing, was chucked in a lathe, bored through the plate section, and threaded. Then, after considerable searching, we located a discarded steel gear large enough and with hub enough to make what we wanted (if we had had steel as large as 7 inches diameter, we would have cut the piece out of the solid).

This gear was worked into the flanged piece B which was threaded to screw tightly into the hole in C. A little countersink having been made in the casting at R, the end of B was riveted over into it forming a lock. Further, rivets A were put in hot through holes in the gear teeth and the plate—with this double security, we don't worry about its coming apart.

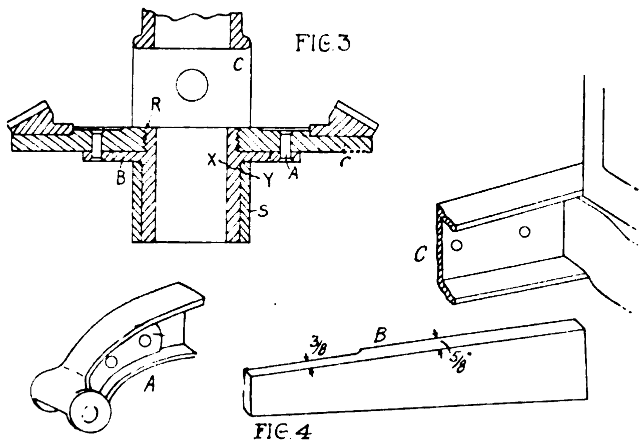
The old hub of the gear was turned off at the back to the same size as the original Dixie part and over it was pressed the roller bearing sleeve S, completing the job. It had been ascertained that there was room for some adjustment in the differential case, part of this being necessary to make up for the ¼ inch flange of D which moved the roller bearing just that much nearer the wheel.

REOS are said to be pretty tough but they acknowledge inferiority to Fords, as in the case we are about to mention. Of course the Ford came away with nothing but scratches; when its dust had settled, the goosenecks of the Reo were discovered doubled under the radiator. Before the goosenecks could be straightened out, they had cracked off completely.

Buy a new frame? I guess not! Mr. Worcester had always had his own way and he was getting too old to change now. He wanted that frame repaired—and a good job made of it too.

Fig. 4 shows the details. A is the right hand gooseneck and C is the end of the frame where A was broken off. It was calculated that a ⅝ inch piece of steel was of equal strength with the depth of channel at the point of break. So pieces of steel were machined to fit into the related parts. One of these is shown at B, tapered to correspond with that in the frame and cut away toward one end to fit over the tail of the spring fork where it lies inside the gooseneck.

Then, a pattern of wood was made and fitted to the contour of a Reo front end—another car—extending



from the radiator to the spring fork. This pattern was used to bend the plates B to and also to correct the shape of the goosenecks. This work, of course, had to done hot. Lastly came the hand fitting and the drilling of rivet holes. Finished and painted over, it made a good looking job and a strong one. In addition to the patches, Mr. Worcester had insisted on welding just to have his own way. The cost of this first class job was not half that of a new frame, not considering the work of tearing down the whole car and erecting it again.

A BIT QUEER

YOU meet with many odd little ordinances as you tour the country. Over in Connecticut, you can leave your car at night without the lights on, if the car is within fifty feet of a street lamp. When you get over the line into Canada, you walk and drive to the left when meeting those coming toward you. Bicycle riders on the sidewalk arouse your curiosity in Elmira, and you wonder that the "cops don't run them in," until you learn that an ordinance permits them to do this where the street is not improved—and factory workers take full advantage of this.

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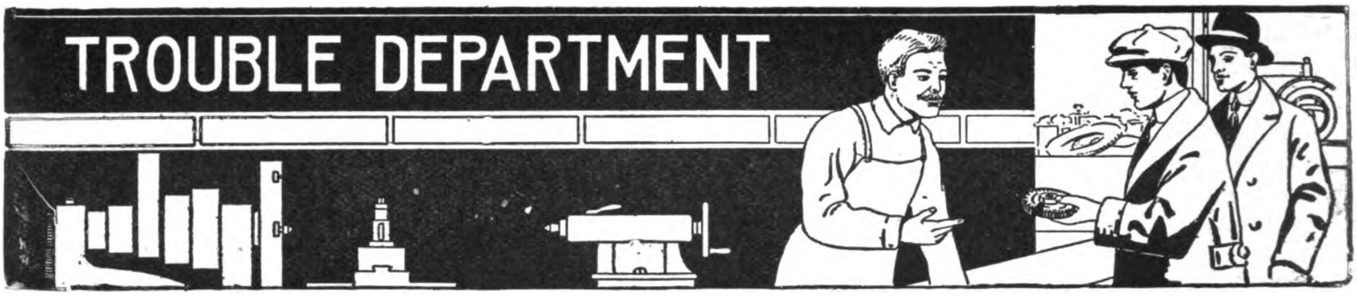

Installing an Ammeter on Any Car

3068

The trouble department Editor is almost ready to tear his hair in great grief, because, he says, so many subscribers lately are asking the same question without reading the trouble department. So before you write your question, please read this first part of the department.

It seems that all of this poor editor's brain storm is caused by the simple query of "How shall I install an ammeter on my—car?" Except for the name of the car, he has a small pile of letters which all read the same, and he feels that it is unnecessary, wholly so, to answer each one. In fact he was just into the "sanctum" with the ultimatum that he simply wouldn't answer 'em, and we could go home and eat pea-soup if we wanted to, or go out and dig worms.

Now we cannot afford to have our mechanical editor so wrought up. In this condition he is prone to tell the readers to put sand in the differential, ground glass in the lubricating oil and cement in the radiator. And so we will try, in our poor, Managing Editorish way to explain matters.

First and foremost you cannot install an ammeter on every car; because every car is not built that way, some are different from others. What we mean to say is that one can install an ammeter on one car and not upon its cousin. F'rinstance, your brother might be able to slip his feet into number 7 shoes whereas you need a pair of double A tens to navigate in, or vice versa.

Before you spend your good money for an ammeter pull the hood up and take a good long look at the generator or motor-generator.

You may see several wires, big and small, connected to its tail, they may be red and green, white or black, greasy or clean. At any rate if it is a motor-generator you will find one big fat wire leading to the starting switch and thence to the battery. From this wire, either at the starting switch or at the generator itself, you will find a skinny, thin wire leading up to the switchboard. And now listen carefully. If the other side of the battery is grounded, this thin skinny wire carries all of the charging current, but none of the starting current. An ammeter connected in this small wire will show the correct charge and discharge.

But if the other side of the battery is not grounded, then you have our permission to write to us for help, you may need it. If you have a two unit system you can install an ammeter, usually, at any point between the generator and the switchboard.

One more word and we'll resign the space to the regular trouble editor. If the ammeter shows "charge" when the generator is not running and the lights are on, then simply reverse the connections on the ammeter.

Reaming Valves in Ford Car

3069

From Alden Kirkpatrick, North Dakota: Would you advise the installation of Fordson valves in a Ford car engine? Would it be impractical to ream the engine valve seats larger? Would it be practical to ream the ports larger to admit more gas?

I have a high tension K-W magneto which I would like to install on my Ford car. My idea is to cut a slot in the timing gear housing, turn down a timing gear so that it will be thinner than the ordinary gear and put this on the magneto shaft. By doing this I would not be obliged to have the slot in the housing so wide as otherwise. Have you any better suggestion? Are overhead valves better than side valves?

Reply: It is not practical for you to ream the valve seats larger than is necessary to obtain the proper face for the valves. The whole life of the engine depends upon two things, the amount of metal in the cylinder walls and the amount of metal in the valve seats. So long as there is metal in those two places, they can be repaired but when too much metal is removed then the engine block is worthless.

For this reason one should not cut off the valve seat material any more than absolutely necessary. Of course if you want to make a racing engine of your machine, that is a different matter. But to make a racing engine there are other important facts to be considered.

For ordinary driving purposes it is inadvisable to change the size of the valves or ports in the Ford engine. The amount of power gained is so very small that it cannot be considered. It will be wholly unsatisfactory for you to ream out the valve ports because even if the hole were the size of a house the cylinders wouldn't take any more than they would hold. The valve ports, at present, are amply large enough to supply an engine of much larger size.

There is a big advantage in the overhead valve equipment in that the gas, entering from the top, swirls around in the explosion chamber and is more com-

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pletely mixed than when it enters from the side. Then again the "dead" space, normally taken by the port chambers is eliminated.

We would not advise you to cut a slot in the timing gear housing and adopt the side mounting of the magneto as you contemplate. In the first place you will be bothered by oil leakage through this slot. Each gear tooth will carry a few drops of oil to the slot, transfer it to the magneto gear and it will be wasted; not much at one time, but considerable in the course of a few hours running. By making the magneto gear much thinner you will render it more susceptible to wear. You may be forced to use a new gear every year. The narrow gear will wear a ridge in the timing gear and within a short time the gears will squeal like a scared pig.

The Bosch magneto people make a special adapting unit for fitting their magneto to the Ford car, get their specifications and see if you cannot use it. Also write the K-W people, possibly they can supply a similar unit for their machine.

Diagram of Hupmobile, 1916

3070

From Edward Nostrand, New York: Will you kindly give me the wiring diagram of a 1916 Hupmobile?

Reply: The diagram is printed on this page.

Starting Engine From 110 Volts

3071

From Chas. Clark, New Jersey: Is there any way in which I can utilize 110 volt house lighting current for starting my automobile engine? My car is equipped with a 6 volt battery.

Reply: This question is a very excellent one and we are surprised that none of our other readers have thought to ask it. If house lighting current could be utilized to start an engine on a cold day, or in the morning, it would cost far less than current from the storage battery.

A storage battery might last for seven or eight years or even longer if it were not used for cranking the engine. If house lighting current were used, the engine could be started for a fraction of a cent.

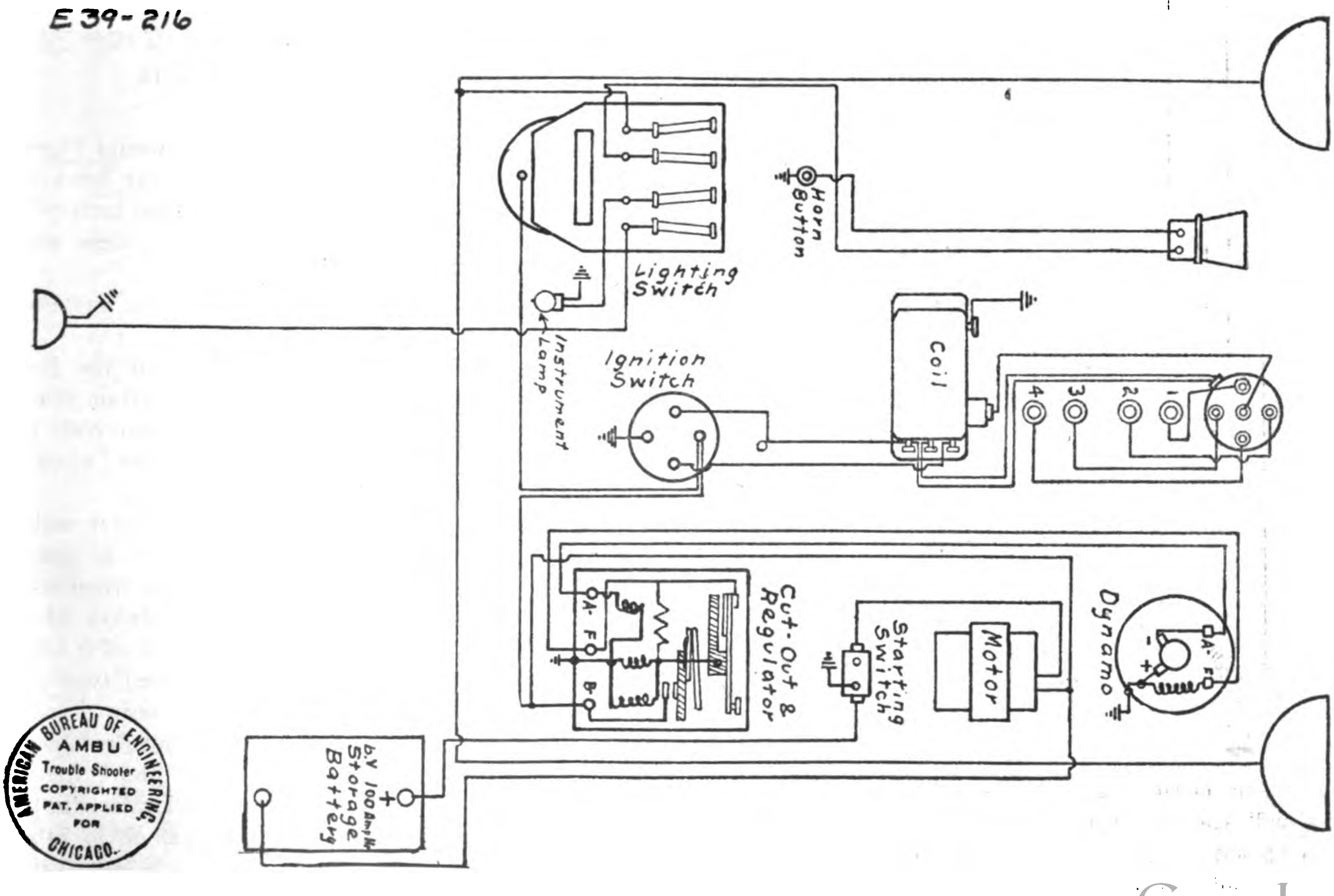
Unfortunately the house lighting current cannot be connected directly to the automobile starting motor, for it would destroy that unit very quickly.

The only way to utilize the house lighting current is to connect it with a motor of the proper voltage, and of about 3/8 to 1/2 H. P. In your case you would need a 110 volt alternating current motor of the repulsion-induction type, or one which would give practically full torque upon starting.

This motor could be mounted in one corner of the garage and belted to a 4-inch pulley or long wooden roll which is so mounted that the rear wheel of the automobile can be rested upon it. The electric motor can

WESTINGHOUSE Hupmobile 1916 "N"

E39-216



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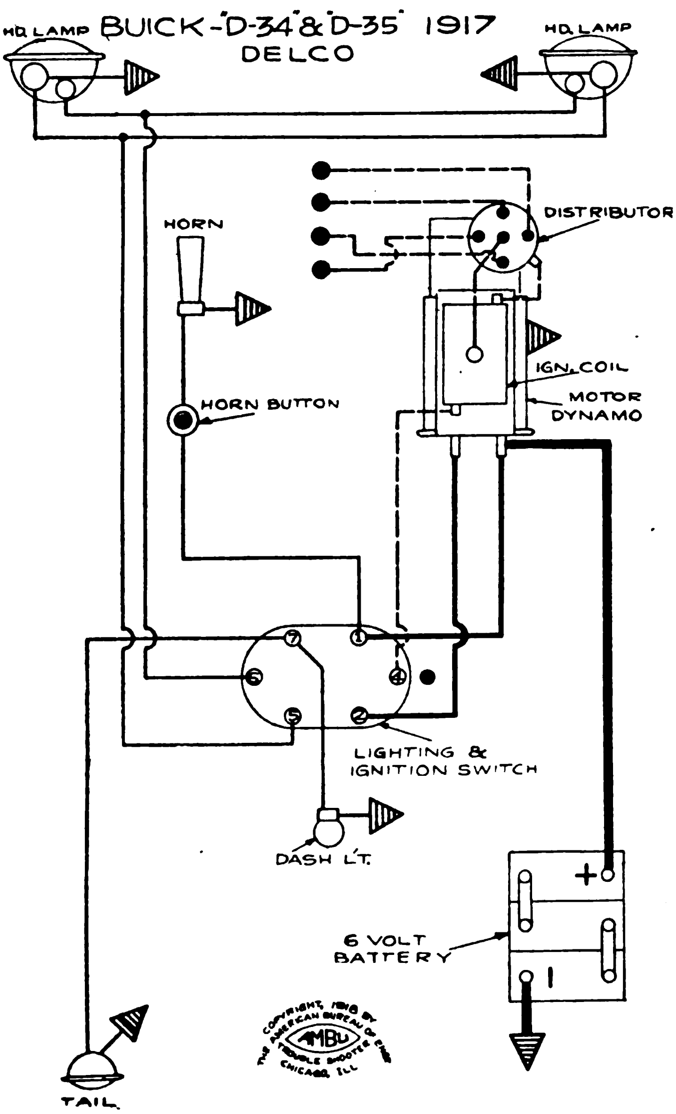
then be started and the high speed gears meshed. By letting the clutch in gently the engine can then be operated. Needless to say the car should be fixed so that it will not move forward or backward while the engine is being cranked in this manner.

Ammeter on Buick DE 35

3072

From Ralph Itzo, New York: I have a 1917 Buick Four, Model DE 35 upon which I would like to install an ammeter. Will you kindly tell me where the ammeter should be placed?

When I am driving up hills and the car speed drops below 15 miles an hour the engine knocks. It does no good to retard the spark. What is the trouble? The engine also knocks when the car is running from 8 to 10 miles per hour and I accelerate quickly. But after



the engine is running 20 miles an hour rapid acceleration will seldom cause a knock.

After cleaning out the carbon the trouble is not so evident, but it soon returns again. I have had in mind the installation of two gaskets between the head and the block so as to reduce the compression. Do you think this advisable?

Reply: If you will examine the wiring on your car you will find a heavy cable leading from the motor generator to the positive terminal of the battery. From this cable a small wire leads to the lighting and ignition switch and this wire should be tapped and the ammeter connected in it.

This engine is of the high speed type and naturally when the car drops below 15 miles an hour the engine speed is below normal and it will not generate as much power and torque as it will at the higher speeds. In other words it is easy to overload it at the 15 mile per hour speed and naturally it knocks. The only remedy is to drop back into intermediate speed as soon as the car speed falls below 15 miles per hour on grades.

The knock caused by rapid acceleration at the 15 mile per hour speed is from a similar cause to that explained in the above paragraph. At 15 miles an hour the engine is giving a certain amount of power but suddenly you open the throttle and feed it gas enough to generate, in the cylinders, much more horsepower than the crank shaft can absorb, hence it knocks. At the 20 mile rate the engine is working under more normal conditions and is consequently much more flexible.

We would not advise you to change the compression ratio by adding an extra gasket between the head and block. Should you do this you will probably cause loss of power and you will have difficulty in keeping the joints tight.

Counterbalances for Ford Cars

3073

From J. C. Moore, Pennsylvania;—I would like to change the ignition system on my Ford car from the timer to the distributor system. There is no battery on my machine. Would such a distributor system work satisfactory on the magneto?

Are the Dunn counterbalances practical for any Ford engine?

Reply:—Perhaps the greatest criticism of the Ford car is its lack of a good ignition system. Certain timers will give satisfaction but since there are four coils the chances for trouble are much greater than when a single coil system is used.

Practically every ignition system manufacturer makes a special unit system for the Ford car and in nearly every case the system will give satisfaction when used with the Ford magneto. However, it is always advisable to carry a set of dry cells for use in case of trouble.

The Ford engine is not of the high speed type and about 15 miles per hour in high gear is the normal speed of the engine. At this speed the engine runs, or should run, with a minimum of vibration. But above the 15 mile per hour rate the engine usually vibrates due to the whipping of the crankshaft, perhaps, or to other unbalanced parts.

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Unquestionably a set of counterbalances on the crankshaft will help matters. We feel that the Dunn counterbalances will prove satisfactory to you, though we do not wish to recommend them in preference to others on the market. In every case the manufacturers are doubtless trying to put out satisfactory products; the mere fact that there are a number of counterbalances makers is proof that this equipment is proving generally satisfactory.

However, do not expect the counterbalances will remedy all the evils, regardless of conditions. They will only balanc the shaft itself, they are not a "cure-all" for vibration. You should take care that the reciprocating parts, (the piston, wrist pin and connecting rod assembly) are balanced with each other that the flywheel and magneto assembly does not throw the balance off.

If properly installed the counterbalances cannot be thrown off.

Wiring of Lexington Model O.

3074

From H. L. Harrison, Michigan: Will you kindly print the wiring diagram of the Lexington, Model O, car which was put out in 1916, I think? This car was equipped with a two unit starting and lighting system. Will you also show where the ammeter should be located?

Reply: The wiring diagram requested is give below. The connection for the ammeter is shown in the lower left-hand corner and is marked "Indicator."

Headlight Lenses Break

From D. A. Harrington, New York: I am driving a truck and the vibration frequently causes the headlight lenses to crack. How can I prevent this trouble?

Reply: It is not the vertical vibration which causes the trouble but the horizontal rattle against the lens. It will be an easy matter for you to cut a strip of inner tube, about one inch in width and long enough to go entirely around the outside of the lens. Hold the end of the rubber strip against the edge of the lens and pull tightly and the rubber will fold over the edge and rest along the front and back of the glass.

A bit of glue or shellac will hold the rubber in place until you have clamped the lens into the holder, then the rim itself will hold it firmly. If there is still any amount of looseness in the glass and container, cut out a large washer of cork or corrugated paper and put it between the lens and the holder.

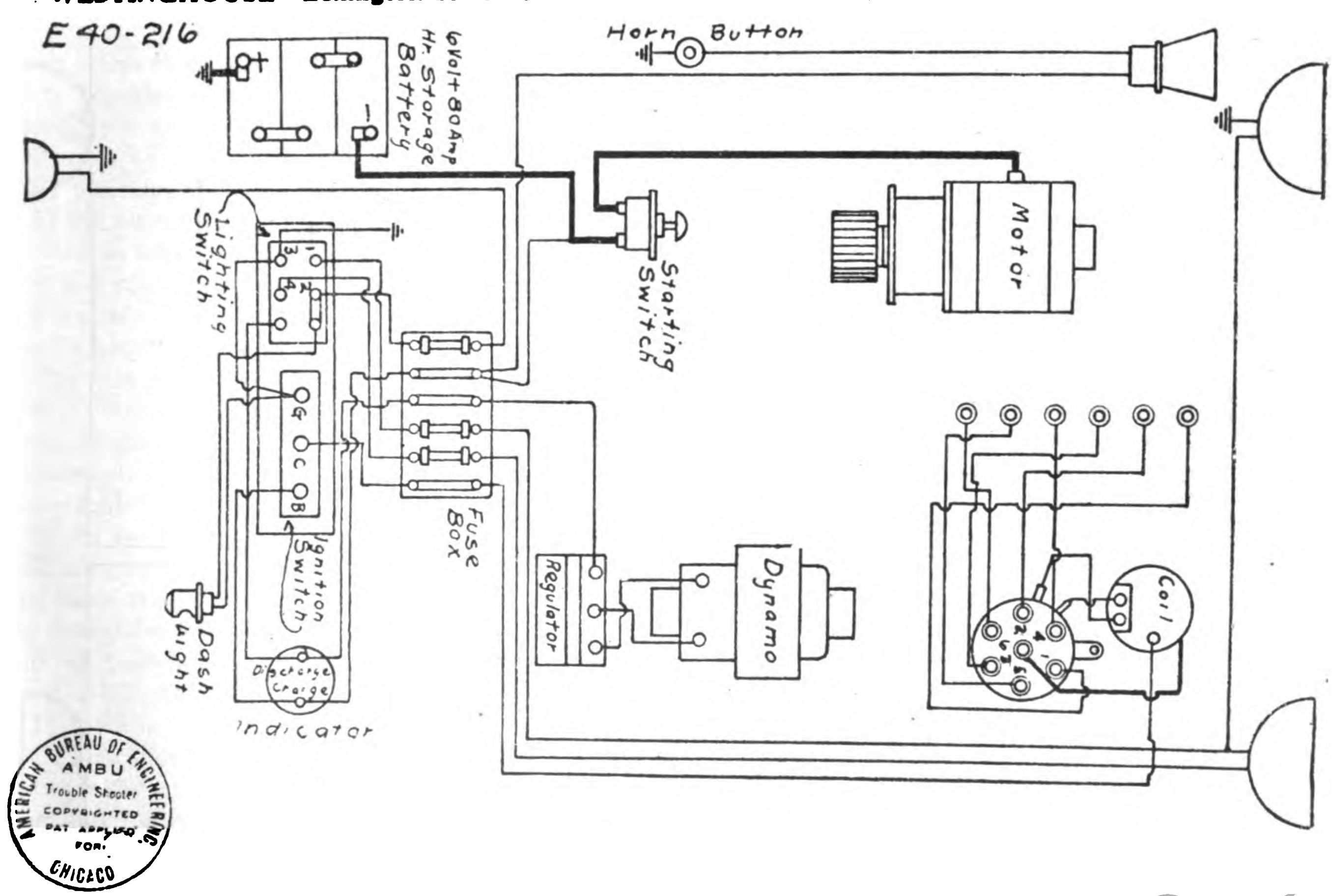
Buick Oil Trouble

3075

From Amede Gauff, Louisiana: I have a Model K-45 Buick car and this machine is giving trouble. The oil tends to work out of the timing gear housing at the point where the fan driving pulley is attached. Is there any way to remedy this defect?

This engine also back-fires after the ignition switch

WESTINGHOUSE Lexington 1916 "O"



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is turned off. I have cleaned out all of the carbon from the cylinders, etc. The timing I know to be correct and the switch seems to be in good order. This trouble is evident even if the engine is operated for only a few minutes and it back-fires practically every time the switch is turned off.

Reply: The oil leakage from the timing gear case, around the camshaft extension can be remedied very easily. Remove the cover and you will find that the housing is somewhat depressed at this point. Fit a steel washer to the shaft, make it a fair running fit and then drill it with three small holes, evenly spaced. Drill and tap three corresponding holes in the cover and screw the washer to the cover, putting a felt washer between the two parts. The felt will expand around the shaft and prevent leakage.

The back-firing is probably caused by an overheated projection which may be inside the firing chamber, inside the exhaust ports or in the exhaust line. Clean the exhaust line and the muffler and examine all parts for projections or thin pieces of metal which might heat up and cause the explosion.

Wiring of Empire Car

3076

From W. R. Cassidy, Vermont: Will you kindly print the wiring diagram of the Empire "45," 1916-1917 Car?

Reply: The wiring diagram of this car is reproduced on this page.

Poor Ring Fitting in Ford Engine

3077

From R. O. Kohler, New York: I have a Ford sedan, 1920 model which has given me a lot of trouble. It has been ran about 6,500 miles. After running about 4,500 miles the engine began to act unevenly, the plugs fouled very quickly and it seemed to load up with oil very rapidly. Finally I had the engine taken down and new rings installed on all pistons. At first everything was all right but after two months of use the trouble started again worse than ever.

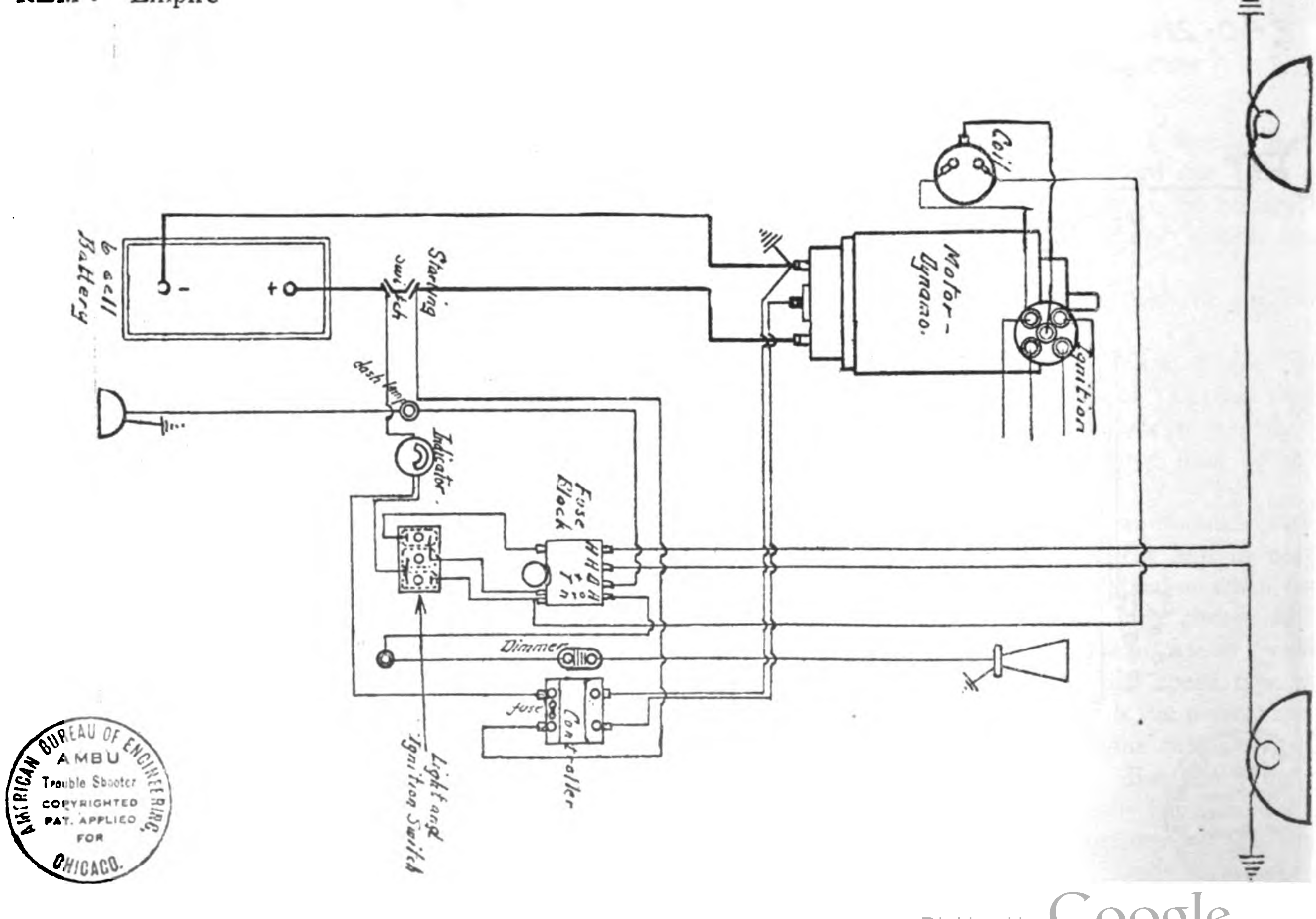
Then I had the cylinders rebored, new pistons, rings and wrist pins put in. Valves replaced with oversize and the whole job done as thoroughly as possible. At first the engine was very stiff and we had to tow it but it limbered up after a while. I drove it very carefully and did not race the engine. Since then I have driven about 300 miles and a short time ago it began to lag again; acting as though it lacked gas.

Examination shows no carbon to speak of, but two cylinders are scored, not deeply but the scores are there, one can see them but hardly feel them with the finger.

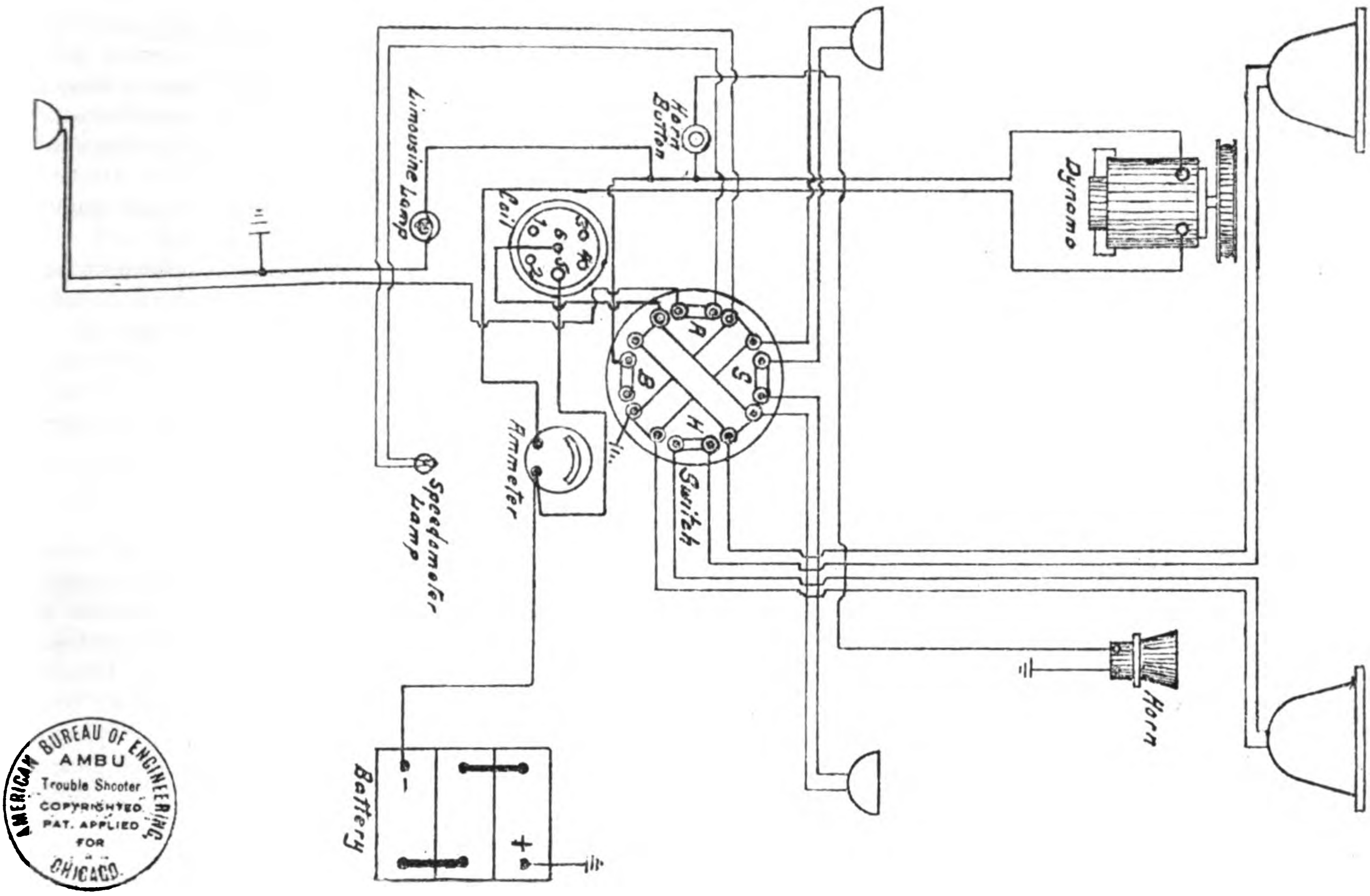
My repair man tells me that he thinks the cylinder block is of inferior material and that I will always have trouble with it. Would you advise me to sell the car and get another make? Are all Ford cars like this? What is your best advice?

Reply: We are inclined to believe that the first time the engine was repaired the rings were not properly

REMY Empire



WESTINGHOUSE Fiat 1914 Lighting



fitted. But since the overhauling, the second time, the early troubles have been obviated. You say that at present you are not bothered with oil trouble, that after 300 miles of running no appreciable carbon is present. This indicates that the rings are now fitting properly.

If the scores were deep enough to cause trouble, you are led to believe that everything is caused by it. We feel that your engine can be repaired to give satisfaction and unless you have the money to invest, would advise you to keep the car.

The first thing for you to investigate is the compression. Find the actual compression by means of a compression gauge. If the compression is in the neighborhood of 60 pounds per square inch it is normal and the trouble is elsewhere.

If the compression is below 55 pounds, then your car will not give normal power, it may also miss explosions and cause trouble generally. This low compression may be caused by leakage, but the indicator will show this fact by jumping to maximum and then slowly falling back, while the piston is at top center.

If there is little leakage, but the compression is low, then indications are that the new pistions are shorter between the wrist pin and the top than were the old ones and thus the compression ratio is less than before.

If you care to talk the matter over we will be glad to have you call at our office.

1914 Fiat Diagram

3078

From Vincent Bissulk, New York: I would appreciate it very much if you would give me the wiring diagram of the system used on the Fiat Model 55 car.

Reply: The wiring of the Fiat car requested is given above.

3079

Questions on an Overland Car

From C. W. Shorman, North Dakota: I have an Overland Model 83 which leaks oil upon the brake bands. For this reason I would like to install a new set of oil retaining, felt washers. Is it necessary to take out the differential to get at the washers?

I have an Everready storage battery and on testing the battery, immediately after running the car, the electrolyte has a reddish brown color, but after standing for a while the liquid is clear. What is the cause of this?

I am also having trouble with the Bendix starter on my car. The pinion meshes only about half way and this causes undue wear on the flywheel teeth. As a matter of fact I have already been obliged to install a new flywhel because of starting tooth breakage. How can I prevent this trouble from recurring.

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Reply: The grease retaining washer is located between the differential roller bearing and the housing on the right side of the rear axle and on the left between the ball thust bearing and the housing.

To get at these two grease retainers it will be necessary, first to remove the axles. Then you can take off the caps from the differential roller bearings and remove the differential with the bearings. The thrust bearing and retainer can then be taken out and replaced with new. Be sure to put all the parts back in exactly the same places as originally.

The brown color of the electrolyte is nothing to worry about. Quite frequently the sulphuric acid attacks the wood separators and there is a small amount of coloring matter passed into the solution. The separators are treated to remove any damaging impurities when the battery is first made.

Again, there is considerable agitation in the liquid while the battery is charging and this tends to stir up the finer particles of mud which ordinarily collects at the bottom. It soon settles, however, and seldom causes any trouble.

Your trouble with the starting pinion should be remedied at once or you will strip the flywheel gear again. Either the Bendix shaft is bent or the threads are gummed up. Remove the starting motor and locate the trouble. Do not put it back until the starting pinion runs out to the end. If you cannot make the repair it will be advisable to take it to a repair man immediately.

Before making any adjustments or repairs on the starting motor be sure to disconnect the storage battery, else you may get into trouble.

Diagram of King 1915, Model C-4

3080

From Harry K. Atlee, Pennsylvania: I have a Model C-4 King car which I am overhauling and would like a wiring diagram before I start work on the electrical system. Can you send me one?

This car is equipped with a Ward Leonard starting and lighting system, two unit and a six volt battery.

Reply: The wiring diagram requested is printed at the bottom of this page.

Excessive Current Discharge

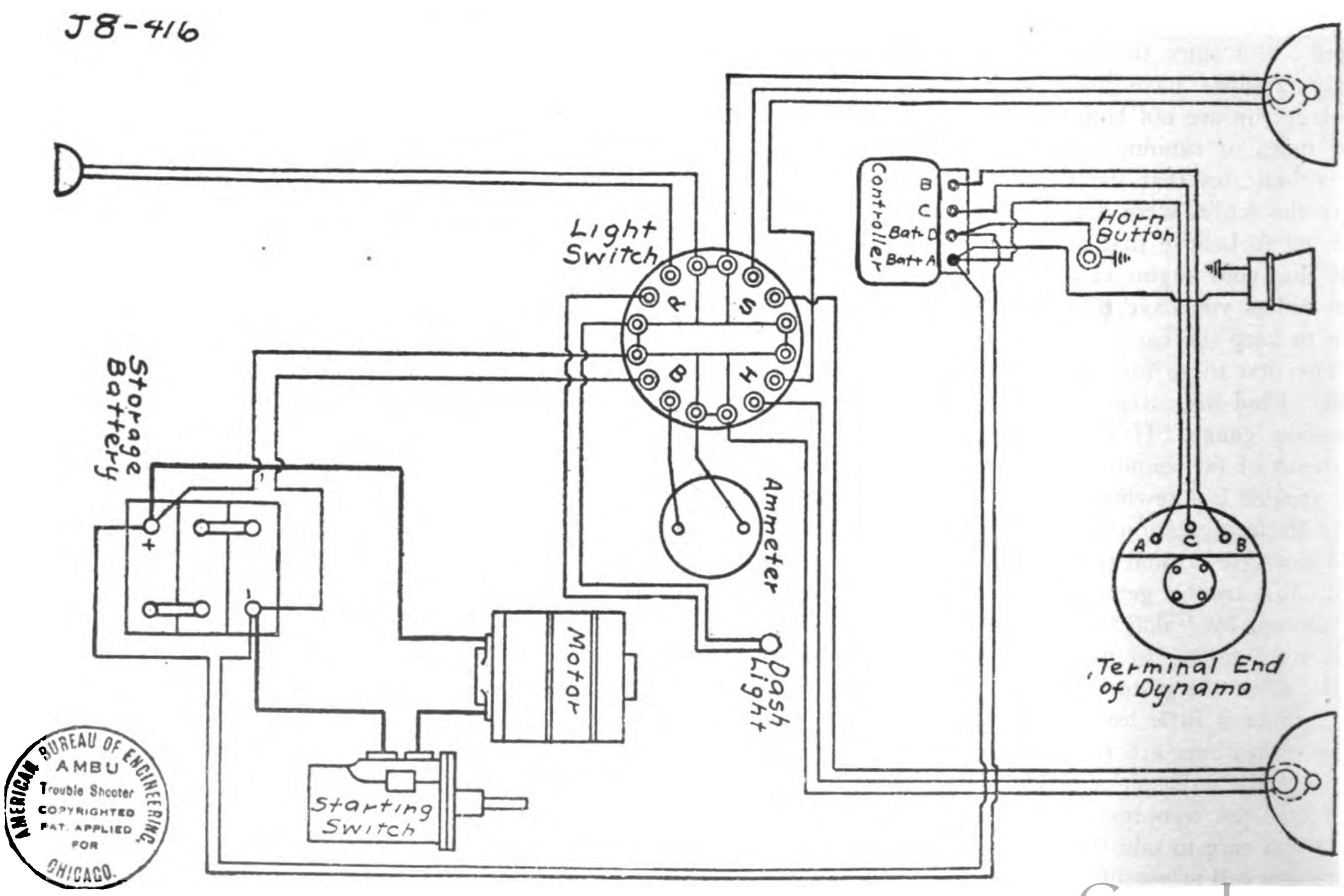
3081

From Oliver Whitlock, Missouri: I have a 1917 Studebaker "4" equipped wtih a Wagner system of starting and lighting and with Remy ignition. The lights, etc., are of the grounded return type.

After the engine has been running but a few hours the current drawn is enough to discharge the battery, despite the fact that the generator charges at around 8 or 10 amperes. When the starting motor is disconnected there is not such a great drain on the battery. Would it be practical for us to install a different system?

Reply: Your trouble is not due to a faulty system but to faulty wiring. The amount of current used under normal conditions is less than that supplied by the gen-

WARD-LEONARD KING 1915 "C-4"



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erator. As a general rule the generator tends to overcharge the battery on the average car.

We would advise you to go all over the wiring system; make a very careful search for grounds or short-circuits. Since you say that the ammeter shows a charging current, it is obvious that the heavy drain on the battery is between the battery and the ammeter or along the starting current line. Examine the heavy cable which runs from the battery to the starting switch and thence to the starting motor. It is possible that this cable is grounded. If it is of the armored type it may be that the insulation inside the armored covering is broken down and current leaks to the armor and thence to the frame of the car.

If you do not find trouble here, then examine the starting switch itself. Possibly this unit is at fault and that it keeps the connection even after you have released the starting button.

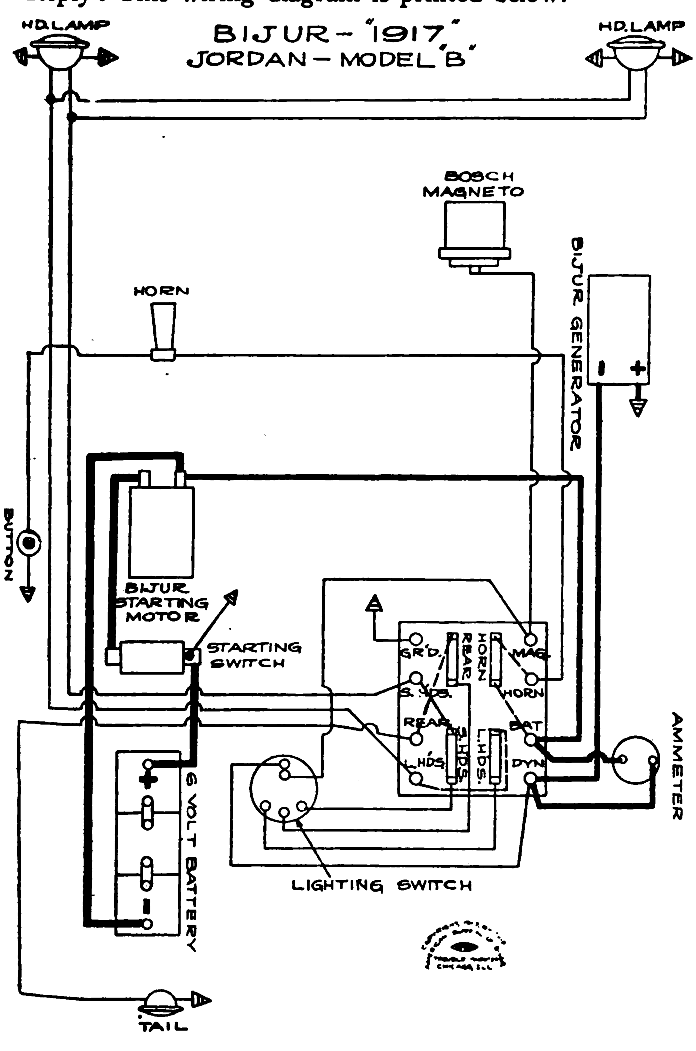
If you still have trouble examine the wire which leads from the battery to the junction box on the dash.

Wiring of Jordan Model B

3082

From James K. Abbott, Massachusetts: I have a 1917, Model B Jordan car equipped with a Bijur starting and Lighting system and Bosch magneto. Can you give me a wiring diagram of this car?

Reply: This wiring diagram is printed below.



Dodge Car Clutch Trouble

3083

From J. F. Irwin, Ohio: I have a 1919 Dodge car which has been driven about 2,000 miles and has a spinning clutch. I have cleaned it with gasoline, Fuller's earth and turpentine. The latter seemed to do some good but as soon as the clutch leather dried out the trouble reappeared.

I have come to the conclusion that perhaps a corner of the lining is doubled over or one of the compensating plungers sticks. Do you think it advisable to dis-assemble the clutch unit and repair it?

Reply: From what you say we assume that your clutch continues to spin even after the pedal is thrown out, thus giving you trouble in changing the gears.

Obviously there is a contacting surface between the clutch leather and the flywheel, or the thrust bearing around the crankshaft extension is caught in such a way that the clutch cannot run free.

It should be an easy matter for you to block the clutch pedal forward by placing a wooden wedge behind it. Having done this, turn the clutch drum around and inspect the leather surface. If the drum drags heavily it can be turned by meshing the high gears and having a friend turn on one of the rear wheels. Any high, contacting point in the clutch facing can then be found.

If you find that a corner of the fabric is sticking up you can easily cut it off with a sharp knife. If you find no projecting surfaces, but the clutch drum turns extremely hard, then the trouble is in the ball bearing at the center of the flywheel. You may be able to loosen it up by squirting kerosene into the bearing and then using some thin lubricating oil. If not, then you should dis-assemble the unit.

PLENTY of mechanics, as well as car owners, have not the necessary skill to caliper parts any closer than 1/32 of an inch. This is not to be expected, for they have not had the advantage of any regular training, but it is highly to be desired in car work—for instance, in fitting in a set of pistons.

Here is a suggestion that will help over the lack of skill on the piston job. Tear a strip of newspaper in width about one-quarter the circumference of the piston. This is an average of 0.004 of an inch thick. Reduce the new blanks until they can just be shoved in the cylinder bore with the newspaper alongside. This will show you the clearance required far better than guessing it. As the head end should be smaller than the skirt end, reduce the piston so that when started in about an inch, the head end is free (with the newspaper) while the skirt end is decidedly snug.

If these directions are followed out, the pistons will be as nicely fitted as if done by really skilled mechanics who used micrometers on the job. It really is folly for anyone without careful training and experience to fuss with either calipers or the micrometer.

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Automobile Dealer and Repairer

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MISSING NUMBERS—Our readers should remember that we are always pleased to re-send numbers which have gone astray in the mails.

Signs of Spring

THE POET tells us to listen for the early robin whose note heralds the coming of Spring; the budding trees, the melting snows and the balmy breezes which waft down our necks and give us those chills which are termed the greetings of Spring are all signs that another glorious motoring season is approaching. But before all of these things, before these Spring signs of the poet, comes a more suggestive indication that there is a Spring budding in Motordom.

Cup your hand to your ear and you will hear the cheerful tinkle of the tinkerer's hammer against the mudguard of his car; his language may not be of the best as he removes the dent which some other fellow gave him, but it is cheerful nevertheless. Look out of our windows and on every hand you will see your friends, clad in greasy overalls running to and fro from their dinky little garages.

And then some fine morning you wake up feeling particularly fit and you too don a pair of old trousers and crawl beneath your little machine with the idea of getting it ready for its year of strain. The signs of Motordom's Spring always precede those of the poet by some weeks, but they are just as positive.

The time for Spring cleaning is here, it should not be put off. Tune your car to the season and put it into condition now, you will not find time for this work later.

Lubrication is the most important feature to be attended to. Inspect every grease cup and take nothing for granted. While the car is still jacked up, clean the springs and give them a coating of oil. Put the oil between the leaves and into all the oil cups. Don't forget to drain the engine, the gear-case and the rear axle, flush the parts with kerosene and refill with clean lubricant. You will find that the old grease and oil will flow out faster if you heat the parts first.

Don't forget to clean the steering gear and oil it. Examine every clevis and joint for upon these parts depend the lives of your family, your friends whom you take to ride and yourself. Before starting the new season be sure to clean the radiator and cooling system. The engine may not overheat now, but in a few more months, when the old mercury is playing with the sun, your engine will need all the radiating surface possible.

It isn't a bad idea to drain the gasoline system and clean the carburetor, you have more enthusiasm for the task now than you will have later.

It seems fitting that Nature's law should be utilized. Into every car owner's heart, as Spring approaches, Dame Nature instills a germ of car cleaning and overhauling. The germ flourishes just as hardily as does the one called "Spring Cleaning" which drives your wife to make the house a thing of undistilled chaos.

And this car cleaning germ is contagious. One day the talk is all about the new treaty, or about the new Pope or about Prohibition and the next day, in the trains, the street cars and in the lunch rooms every man is talking about his car. He speaks of his carburetor or his axle or his radiator in much the same way as he would about his digestion.

A foreigner, visiting this country during this season might well wonder what part of a person's anatomy comprised the cooling system or the running gear.

And since the spirit is upon us, now is the time to clean, refit and repair our cars. A few more weeks and it will be too late, for in a breath, as it were, our friends will cease their gossip about their distributors and spark plugs and conversation will be made up of putts, green, mashies and making the courses in par, whatever that may mean only a golf enthusiast may know.

If you are one of the prepared type of motorists you will have your car ready to greet the first note of the robin; it will be in condition to drive into the country amid the bursting buds with which Nature will start her Spring drive.

And as you read this Editorial, bear in mind that the success of your next Season's motoring depends upon the zeal with which you attack the overhaul of your car now.

"Gasoline—the New National Drink"

WITHOUT casting any reflection upon the other worthy and interesting speakers at the annual banquet of the National Automobile Chamber of Commerce, we want to make special mention of one speech which was delivered by America's best known humorist, humanist (if we may coin a word), and excellent writer, Irvin S. Cobb.

Whatever Mr. Cobb says or writes has a human interest, he knows his audience, he can sway them to

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laughter or tears and when it is laughter, the humor starts in one's toes and works upward gaining impetus as it goes until one is, figuratively, changed to a human smile from toe to head.

But Mr. Cobb is something besides being a humorist, he is a man of broad experience and one need but note a statement which he made in the latter part of his speech to know this.

He took, as his subject, "Gasoline—The New National Drink" and we quote a statement which he made: "Back in '61 had there been broad, smooth highways, running from the Gulfs to the Lakes, and were the man who lived in South Carolina able to step into his lizzie and turn on the gas and cruise away to Vermont and find out that the people there were of his own blood, with the same aspirations and the same desires for decent and orderly government, this country never would have been rent by a great Civil War."

He goes on to say that from his experience in the Great War, he would assume that had the people of Europe been equipped with cars as the American public is equipped, with no artificial barriers, there would have been no war—there could not have been a war.

We feel that Mr. Cobb is right, the automobile is a wonderful instrument for peace because it promotes human acquaintance. After all, national disputes arise from mis-understandings and mis-understandings cannot exist if personal intercourse is made possible by inter-communication.

We have the automobiles, we need the roads. It is the duty of every citizen in this country to spread the "Good Roads" propaganda and until we have a net-work of excellent automobile highways laid down we cannot say that this nation is a true "United" States.

Your Number Plates

WE do not recall ever having read an article relative to the placing of automobile registration number plates; perhaps the subject is not big enough to deserve treatment in a special article, perhaps no one has realized that it is a problem to be solved, but a little thought on the matter would indicate it to be a vital one.

The placing of the rear number plate presents no difficulties but what is to be done with the front one is an important question.

The writer but recently has given the subject attention and has found by actual count that over fifty per cent of the number plates are mounted in such a way as to obstruct the free passage of air through the radiator.

A large majority of the modern cars carry a connecting link between the head lights and it is this link which is used for holding the majority of number plates. For the Winter season there is little to criticize in such a mounting but when Summer comes and your car needs all the cooling surface possible, it is not a good plan to obstruct the radiator.

If your engine tends to overheat, look to the mounting of your front number plate and see that it is not cutting off a large percentage of the radiating surface.

A second point to observe is the height of the plate from the ground. In many states a minimum height is mentioned, usually 13 inches or thereabouts; and for this reason be careful not to place the plate too low.

There is usually room between the starting crank and the lower edge of the radiator and this is the ideal place. If the car is swung high from the ground the plate may be placed beneath the starting crank and still be over the minimum, legal distance.

SOME engines of the L and the T head type have given considerable spark plug trouble. The plugs are set in bonnets directly over the valves where they naturally got much heated. This trouble was first widely encountered during the latter days of the war when some spark plug materials were getting scarce and substitutes were being used—the remedy applied may serve as a valuable hint to those who still have trouble of this kind in special cases.

Bonnets made of aluminum have effectually cured the trouble; these are more expensive than the cast iron bonnets but the cost has often been saved in a month's time. A pattern has to be made, castings of aluminum secured from it, and the bonnets machined at a local shop—the extra cost is entirely in the work being made up specially for if made in quantities, the saving in weight and greater ease of machining would counter-balance the higher cost of the aluminum over cast iron.

METALS are sold by the pound. In repairs, it is often advantageous to know the weight of common materials, such as bar steel. The weight per foot of length of round bar steel is approximately as follows:

½"—	¾ lb.
⅝"—	1 lb.
¾"—	1½ lb.
1" —	2¾ lb.
1¼"—	4¼ lb.
1½"—	6¼ lb.
2" —	11 lb.

Black finished bars usually run a little over size and so weigh slightly more than cold drawn steel. The weight of brass or bronze bars is about 7 per cent more than that given above for steel.

A cubic inch of steel weighs .28 lb. Cast iron weighs 1 per cent less, aluminum is only one-third as heavy as steel, while brass is 7 per cent more.

THE GUDE SAMARITAN

OLD SCOT: Dinna cry, ma wee laddie! If ye dinna find yer penny afore dark, here's a match!

—*Wayside Tales.*

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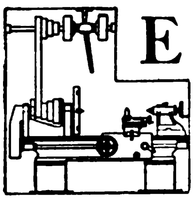
Sales Service and Profits

Not Only Must the Clerk be Eager to Please but He Must Know the Stock

By Warfield Webb



EVERY dealer is eager to increase the number of his sales. He is none the less anxious to improve the character of his trade, for this in turn means that he will be assured of larger sales to a good class of customers. How to do this may not be as fully understood by some as it should be. They are willing to listen and to learn, and so long as a man is in a receptive mood he can profit by helpful ideas. There are of course many good rules to be followed, and many plans that will help to increase the sales. But that which is most desired by the average dealer pertains to the simple and effective plans that will not demand a large outlay. These can be adopted with only a reasonable share of concern, but they must be made effective by insistence on the part of the sales force.

Salesman Should Be Alert

We enter some stores where the attitude of the salespeople is so indifferent that the only reason for buying at all is that the visit to the store was handy, and that rather than go elsewhere the lack of personal desire to please has little effect on the mind. The salesperson does very little to induce a sale, and with a half interested manner shows the stock, leaving it to the customer to decide for himself as to whether he wants the merchandise or not. He does not urge, or he shows no special inclination as to whether you buy or not. It seems, in truth, from his manner that he does not particularly care.

Yes, he answers your questions with as few words as possible, not offering to make any given point clear to you that will help along the desire to buy. If you do so it is simply on account of your own interest being aroused by what has been shown.

But somehow you rather feel or say to yourself that in future you'll go elsewhere for your needs. There is a kind of chill that seems to make you desire to pass up such a store, and to seek the place where there is an evidence that your trade is really desired. You want to feel that at least your money is worth as much to this house as it is to another.

Of course you do not want the salesperson to offer his advice unsolicited, and to urge you against your own judgment in the matter of a purchase. You simply want him to treat you with courtesy and intelligence, and to show you by his manner that he wants you to be satisfied and to call again.

This is why the sales service counts for a great deal in the matter of pleased customers, and why they will come again when there is a need for your merchandise. If the salesperson is really well informed about the stock he is offering he can talk intelligently. Suppose it is only an ordinary tire or device that is wanted.

The customer who is seeking this purchase has a right to know its true value. He has a right to be told in an intelligent manner why it is not as good as a more expensive make. He may not know that the higher priced article is desirable because it has several factors that make it so. Can the salesperson make the points clear? Or if he can will he do so? Does he try to induce the customer to buy a better article? He might go upon the assumption that one sale is as good as another, so long as the customer is satisfied.

This sounds reasonable enough. But is the customer likely to be satisfied after he has purchased the less costly tire, for instance, and has given it a fair try out? That is the point that must be considered. It is not merely in trying to please a customer now. It is to make that customer a satisfied one after the purchase has been made. There are some items that do not demand the same care in the matter of sales as in auto accessories.

An inferior grade or make will often give rise to more dissatisfaction than many kinds of commodities where quality is not so essential. There is a sane reason for this that must be kept in mind. The customer wants to feel that even if he has but invested a limited amount he wants value. It becomes to a great extent of small value where this is not possible. Think of this when you are endeavoring to make a sale.

Salesman Must Be Trained

Then it will be easy to explain why this is true. Of course unless the salesperson is properly trained with regard to this idea he is handicapped, and he can offer little of value to the customer who is not posted. The expenditure of a little more at times will insure the sale being a satisfactory one, and this is what is most desired. Not the first visit only of the customer, but his good will, continued patronage and the help that he can give toward inducing others to buy from you is to be sought.

If there is a pleasant greeting from the salesperson the customer at once feels that he is welcome, and somehow that he is going to be given intelligent service. The customer makes his wants known. The live and well posted salesman at once grasps what is wanted. Is it in stock? Can the salesman answer this at once, or does he have to say, "wait, I'll see if we have this article." If this is his attitude the customer at once becomes suspicious that the service is poor and he loses interest.

Why is the salesman not posted as to what is in stock? There is a lack of confidence on the part of the customer

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that is a bad beginning. He is dubious as to the particular knowledge that the salesman has, and somehow fails to place confidence in what he might say regarding any other item.

Should he answer at once that dealer has the desired merchandise, or that it is not in stock, but there can be shown some other item that may please the customer, this changes the face of the story. There is confidence that the salesman knows his business. He is willing to do all that lies within his power to make this apparent, and it is likely that, unless the customer has made up his mind he will listen to the plea of the salesman to serve him. It is an important part of the sales service plan that makes for profits for the dealer.

Now with intelligent arguments based on real knowledge, there is a good opportunity to induce a sale. The customer might not be so determined as to oppose good logic. He might be made to see that the merchandise offered him is as good or even better than he had asked to see. There is also a possibility that the customer has simply formed his opinion from hearsay, and not from an actual knowledge of the special commodity sought, so that the ability of the salesman can be made to count for something of value.

All Classes of Customers

The tire and allied industry is a large one these days. It must be understood from all angles if the dealer hopes to make sales to all classes of customers. The lines cover a wide variety of items, and the special advantages of each item should be understood if the salesman hopes to meet all kinds of people, and to talk with confidence and intelligence in the matter of sales.

He should be informed as to the value of every item, the special feature of each, and the reason for any particular advantage to any item. If he does this, and if his manner is one of courtesy and interest he can do much to make customers that will be glad to come again and to tell others about the store.

Naturally enough there are other matters that enter into the question of sales service. The stock should be complete, and it should be well displayed. It should offer in a simple yet forceful manner reasons for the public to seek the store in the first place.

It is something to get people inside the store, and this is but the beginning of the sales plan. For after a customer has entered the store he still has to be treated with concern. He has been shown a reason why he should buy, but what is done by the salesman to make this a realization? The sum total of the matter is one that demands care. It has as much or more to do with increased sales to customers who will continue to be satisfied patrons, as it has to do with the kind of merchandise you offer the trade.

COMING AUTOMOBILE SHOWS

February 26–March 4
Des Moines, Iowa. Automobile Dealers' Ass'n. Automobile Show.

February 27–March 4
Paterson, N. J. Automobile Trade Ass'n. Automobile Show

February 27–March 4
Amsterdam, N. Y. Automobile Show

February 27–March 4
Muskegon, Mich. Automobile Dealers' Ass'n

February 27–March 4
Elmira, N. Y. Automobile Club

February 27–March 4
Portland, Me. Automobile Dealers' Ass'n

February 27–March 4
Springfield, Mass. Automobile Show. Automotive Dealers' Ass'n

February 27–March 4
Glenns Falls, N. Y. Automobile Show

February 27–28
Bethlehem, Pa. Automobile Trade Ass'n. Truck and Tractor Show

February 28–March 4
Bay City, Mich. Automobile Dealers' Ass'n

February 28–March 4
Wichita, Kansas. Motor Trade Ass'n

March 1–4
Evansville, Ind. Dealers' Automobile Club

March 4–11
Brooklyn, New York. Motor Vehicle Dealers' Ass'n

March 4–11
Youngstown, Ohio. Automobile Dealers' Ass'n. Automobile Show

March 6–10
Saginaw, Mich. Automobile Dealers' Ass'n

March 6–11
Camden, N. J. Automobile Trade Ass'n

March 6–11
Indianapolis, Ind. Automotive Trade Ass'n. Automobile Show

March 6–11
Nashville, Tenn. Automobile Trades Ass'n

March 6–11
Yonkers, New York. Automobile Show

March 6–12
Wilmington, Del. Automobile Trade Ass'n

March 10–20
Denver, Col. Automobile Trade Ass'n

March 11–18
Boston, Mass. Automobile Dealers' Ass'n. Automobile Show

March 11–18
Newark, N. J. Automobile Dealers' Ass'n

March 13–18
Omaha, Neb. Omaha Automobile Trade Ass'n

March 15–18
Port Huron, Mich. Automobile Dealers' Ass'n

March 16–18
Logansport, Ind. Automotive Trade Ass'n. Automobile Show

March 20–25
White Plains, N. Y. Automobile Show

March 20–25
Torrington, Ct. Automobile Show

March 23–25
Herkimer, New York. Automotive Dealers of Herkimer County

March 23–25
Kingston, New York. Automobile Show. Automotive Dealers' Association

March 25–April 1
Washington, D. C. Automotive Trade Ass'n

March 27–April 1
Oklahoma City. Okla. Motor Car Dealers' Ass'n

March 28–31
Benton Harbor, Mich. Automobile Dealers' Ass'n

March 28–April 1
Quincy, Ill. Automobile Show. Automobile Trade Association

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Electric Arc Welding

A Cheap, Clean and Simple Method of Making Repairs to Automobile Parts

By F. H. Sweet

THIS deals with autogenous welding by the electric arc process as distinct from electric butt and spot welding. In passing, it may be mentioned that butt welding is an unfortunate expression, and ambiguous. It is used promiscuous- by which we mean that it is misleading ly to designate the joining of two pieces of bar stock by the resistance-welding process, and the joining of the butting edges of two steel plates, for instance, by the electric arc process. It is a pity that we ever got away from the technically correct term resistance-welding to the popular but confusing application of the term butt welding to the resistance process.

Arc welding may be described as a welding process which is in many ways similar to the oxy-acetylene process in both range and method of application, the welding heat being produced by the flame of the electric arc instead of by the combustion of gases in a specially designed torch. The temperature of the electric arc is higher than that of the gas flame, being over 6,000 F., and the heat is more concentrated.

Which Is the Better Process

The question is often asked, "Which is the better process?" It is impossible to return a direct answer to this question. At the present stage of development it is only safe to say that some jobs can be done btter by the one process and some by the other, while some can be done just as well by either.

Also, each process can be used for certain applications which is not practicable to carry out with the other. In my opinion it is safe to say that any job that can be done by either process can be done at a much lower cost by the electric arc, especially where current is fairly low.

The first cost of a good direct current welder complete with equipment necessary for all ordinary jobs of welding, will be from $1,200 up, which is much higher than the cost of a gas welding outfit. The cost of current to run a 150 ampere welder, however, would be about $10 per month in most localities, and this is the only expense apart from rent and other purely overhead expenses which are common to both systems.

There is no constant handling of gas cylinders in and out, no risk of explosion and practically none of fire. With a well-designed current welder there is no risk of shock, on account of the very low voltage of the welding circuit, which is usually 20-30 volts.

A knowledge of the electricity is not necessary to the making of a good electric welder, though it is necessary to a complete grasp of the design and workings of the machine. For the benefit of the man who has had electrical experience, it is sufficient to state that the welding generator is a specially designed, separately excited generator with a differential compound winding, and that an inductive ballast is used in the arc circuit.

The secret of the successful application of arc welding to every-day commercial uses lies in the design of the generator. There have been many attempts to use ordinary D. C. generators for welding purposes, with but indifferent success so far as our experience goes. It is extravagant at the best, owing to the fact that more current is wasted than used, and a much higher degree of skill in the operator is necessary, as the arc is harder to hold. With a specially designed generator the arc is steady and easy to hold, commutator troubles are unknown, and the overall efficiency of the machine is very high.

Range of Arc Welding

The range of application of electric arc welding is very wide and constantly growing wider. In England, steel structures are being erected in which electric welding takes the place of riveting, and, further than this, a high pressure marine boiler has been built without a rivet in it, and has now been in use some time.

Unquestionably operators should wake up to the possibilities of the process. With cheap and plentiful electric power it should have a most important bearing on the immediate future development of many branches of the engineering industries. It might even go a long way towards putting shipbuilding on a stronger basis. Experimental sea-going vessels have been built entirely by electric welding, at a great reduction in cost over riveted construction, even in England, where electric power is far from cheap.

One difficulty, against which advocates of electric welding have to labor constantly, is the popular delusion that welding of any kind is essentially a process for repairing broken or defective parts. Repair work is a minor, though useful application.

The big field for future development is the application of arc welding to manufacturing processes in all branches of the iron and steel industry. The metals that are most commonly welded by the electric arc are steel castings and cast iron. Malleable castings can be welded, and it is quite practicable to join malleable iron to steel. Copper can be welded to steel, and certain applications have been made in welding brass and bronze. Mild steel is probably the easiest metal to weld and the best for a beginner to start on.

Any man of average intelligence can be taught to do straight-forward welding such as the construction of

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steel storage or low-pressure tanks, in two or three weeks. High welding speed and the ability to turn out a good smooth job come with practice. Cast steel is also easy to work. It can be welded electrically without pre-heating and with the certainty of getting a good, strong weld capable of standing high pressure and tremendous bending, twisting and tensile stresses.

With regard to cast iron, it is better not to make sweeping statements. Every cast iron job is a problem by itself and must be approached as such, and with due respect for the text-books which declare that cost iron cannot be welded. Recent developments have tended to furnished grounds for some revision of the text books in this respect.

Even Holes May Be Filled

It has been found by using certain special electrodes, which appears to be practically perfect fusion can be obtained in a cast iron weld. It is possible to fill up a hole in an iron casting and then drill a hole, half in the original casting and half in the added metal, the line of fusion not being discernible. Such welds will also have considerable tensile strength.

When speaking of welding cast iron, we mean welding without pre-heating the castings. It is considered that experimental and research work should be conducted along these lines, because, broadly speaking, pre-heating presents so many difficulties and drawbacks that any welding process which depends on it for a reasonable measure of success is necessarily subject to serious limitations on that score.

The cost of pre-heating small castings is often more than they are worth, while apparatus for heating large castings is costly and bulky. Castings of complicated pattern and section, such as automobile cylinder blocks are frequently warped or cracked in the pre-heating or subsequent cooling process.

Small castings such as handles, levers, etc., can be electrically welded very quickly and successfully by what is known as the carbon arc process. This consists of using a carbon pencil with which to strike the arc and holding a cast iron filler rod in the flame to melt and form the added metal. This method makes a very strong, smooth-looking weld, and is strongly advocated for all such jobs.

The carbon electrode process is not suitable where consideration has to be given to expansion and contraction strains due to local heating and cooling of certain parts of a complicated casting such as a cylinder, press frame or any box section casting. These must be done by one or other of the various suitable metal electrodes or by what is known as the studding process.

An air compressor cylinder was repaired by studding process. This job illustrates the method very clearly. Holes were drilled and tapped on each side of the crank, studs screwed in tight and left protruding about one half-inch from the cast iron. A metal electrode was then used to lace the studs together, the finished weld having the appearance of a rough steel plaster over the crack.

As the weld cooled there was just enough contraction to draw the crack tight. A weld made by this process is surprisingly strong. A great number have been made to my knowledge on punch press frames and similar castings, subject to heavy working stresses, without a single known case of failure.

Not long ago a rather remarkable repair job was carried out on a 1,000 k. w. motor generator set in a section of a northern New York company. A revolving cast steel spider about eight feet in diameter, having field coils on the periphery was found to have three adjacent spokes cracked clean through. Replacement would have cost many hundreds, possibly two or three thousand dollars, as well as trying a badly needed machine up for many weeks. The electric welder repaired the damage in two days, without removing or disturbing any part of the machine.

In an article of this nature it is, of course, only possible to give the barest outline of arc welding, its present applications and future possiblities. To the engineer who has looked into the matter to any extent, the possibilities seem unlimited.

STEEL AXLES

AXLES and drive shafts are about the only parts that can be made as well locally as when secured from the factory. Neither the quality nor the price should be off more than ten per cent. Shops usually carry a good grade of axle steel but I have found that very few of them have any size in stock under 1¼ inches probably because the Ford and Chevrolet axles are on a price and distribution basis all their own.

There are, however, a few other axles of 1 inch, one and one-sixteenth inch, and one and one-eighth inch diameter and a number of drive shafts of this size, the latter on worm drive trucks. When it is necessary to have one of these in a hurry, it is always possible to turn down a larger piece of stock but that is expensive, takes time, and it leaves you a shaft made from the poorest part of the bar.

A most excellent method is to make the shaft out of a length of chisel steel. This is a tool steel but not so high in carbon as to be "snappy." It comes in octagon bars, unannealed (hard enough to be used just as it is but not too hard to machine at a moderate speed), and it is obtainable in known brands almost everywhere. The octagon shape is so nearly round that usually it is not necessary to turn it to assemble through the axle housing parts and the only work is the same as if it were round, i. e., the machine work on the two ends.

CONSOLATION

"How did your novel come out?"

"Well," replied the self-confident author, "it proved beyond all doubt that it isn't one of those trashy best-sellers."

—*Boston Transcript.*

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The Differential Action

That Part of the Mechanism Which Allows One Wheel to Turn Faster than the Other

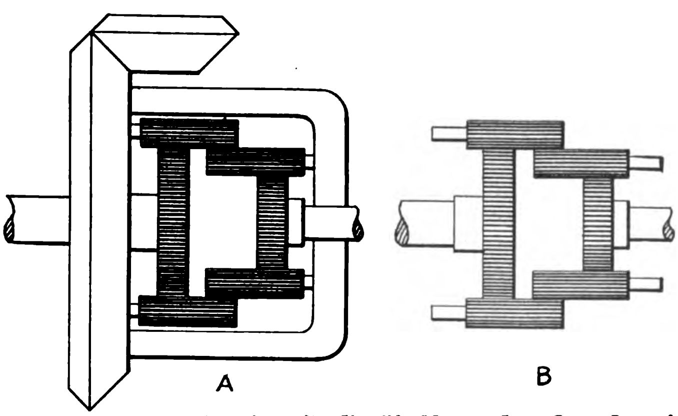
By H. L. Reade

ONE DAY recently, when Doc Edmands and his chore boy had jacked the car up for some purpose, Edmands noticed when he turned one rear wheel in one direction the other wheel would turn in the other. When he told the chore boy to hold his wheel immovable he found he could nevertheless turn the other wheel in either direction.

Here was a mystery. No wonder the car didn't behave well of late. So anxious was Doc that he engaged a cigarette-smoking expert from the garage, who came, looked wise, fussed around for several hours, let the car off the jacks, pronounced everything O. K. and collected nine dollars.

Now in reality there wasn't a thing wrong with the car. The apparently strange behavior of the rear wheels merely exemplified the workings of the diffrential mechanism or compensating gear which, while little understood by the average non-mechanical man, is a part of every rear axle, and incidentally demands some care and attention for its continued satisfactory working.

One essential difference between the horse-draw vehicle and the automobile—a distinction which often escapes the untrained observer of Doc Edmands type—is the manner in which the power is applied in either vehicle. The horse exercises the pulling effort by placing his hoofs firmly upon the ground, making them fulcrum for a leverage the total effect of which depends on the muscular strength of the horse, the weight of the animal and the load.



Illustrating Differential Action. To Simplify Matters Spur Gears Instead of Bevels Are Used. A, Shows Complete Differential; B, the Gears Only.

The motor vehicle, on the other hand, is self-contained, carrying its own power-generating apparatus and securing traction from the friction set up between the rotating wheels and the road surface upon which they run.

The need for a differential or equalizing gear in an automobile arises partly from the fact that in a motor vehicle the power is transmitted from the drive wheels to the road and partly has its origin in the peculiarities of the pneumatic tire.

A differential gear is a device which permits one wheel to turn faster than the other. As a matter of fact every wheeled vehicle has some kind of provision for equalizing its traction. Consider, for instance, the action of the wheels of a two-wheeled cart when the latter is turning a circle. Since the wheels turn loosely upon a fixed axle it is clear that the wheel on the inside of the curve revolves slowly, whereas the opposite wheel turns rapidly, having much more ground to cover. If, instead, the wheels were fixed to the axle so that the axle and wheels were turned togther, the curve would be negotiated only with considerable slippage set up under one or both wheels.

Wheels on Rail-Trains

Even in railroad practice where wheels and axles usually turn as one, some differential action is provided in that the face of the wheels are beveled so that when the train rounds a curve and the centrifugal force swings one wheel against the outer rail, the contract is between the rail and the larger diameter of the wheel on one side. The opposite wheel at the same time travels on its smaller diameter, so that though both wheels make the same number of revolutions, the outer one—since it runs on the outside of the curve—covers the greater distance. That this arrangement for securing differential action is inadequate on the sharp curves of our street railroads is evident from the polished condition of their outside rails, which is caused by the slipping of the wheels and the grinding action set up between wheels and rails.

In considering differential gears for automobiles we are concerned only with the rear wheels used to propel the vehicle, the front wheels which serve at the same time for the purpose of steering are left to turn freely the same as the ordinary carriage wheels.

Automobiles have divided rear axles and the differential generally consists of two sets of gears, one driving set and one driven set. The driving set rotates between the driven set, carrying the latter with it, without, however, preventing the driven set from turning slower or faster, as required. The power is received from the engine by a bevel gear—or in some later construction by a worm—which in turn revolves a large gear wheel in the same plane in which the car's driving wheels move.

The differential action whenever it is required is secured from the action of a number of small pinions operating within internal gears. With the car going

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straight ahead and both driving wheels encountering the same degree of road resistance, the small differential pinions, the internal gears and the large bevel gear of the differential will all turn together. The drive is transmitted through all the pinions and gears, and both wheels travel at the same speed.

When A Curve Is Negotiated

When a curve is turned, however, the inside of which is taken by the left wheel, there will be a drag on the left wheel with a corresponding advancement of the right wheel. The small differential pinions will turn on their spindles with the result that although one driving wheel turns faster than the other, power is being transmitted constantly by both.

If one rear wheel be anchored and the power applied to the other, it will be found that the number of its revolutions is twice as great as when both wheels are turning, owing to the ratio of the pinions to the driven gears. Generally speaking, the wheel that encounters the most resistance from the ground will receive most of the power and turn around faster.

One thing that will have become clear from the foregoing is that the motorist who, when stalled in a snowdrift or a mudhole permits his motor to race with the rear wheel standing still while the other spins at a furious pace, subjects his differential mechanism to strains that may end in permanent damage.

In cars of the lighter type the twisting strain of the rear axle, occurring upon starting or sudden braking, is not taken up by torsion rods, or hound rods as they are sometimes called. In such cases the twisting strains are largely borne by the drive shaft tube and its flanged rear end by which it is secured to the differential housing proper. After continued service the differential housing and drive-shaft tube flange often evinces a desire to part company. The danger of this latter condition is that the drive pinion and the large bevel gear will be in imperfect engagement; gear teeth may even break under these circumstances.

Ample Lubrication Necessary

Since the differential is the place where the hardest work is done, it follows that careful and ample lubrication is in order. All grease used in the differential housing is better for an addition of graphite.

Nor is it a bad idea for the car owner who has used his car intermittently during the winter, to wash the differential casing out with kerosene or gasoline previous to a refilling with fresh lubricant. In the washing operation small metal particles and other foreign matter that otherwise is carried through the gears, will be removed.

THE BOSTON AUTOMOBILE SHOW

The twentieth annual Boston Automobile show will be held during the week of March 11 to 18th under the management of the Automobile Dealers' Association.

This being New England's biggest automobile attraction, and ranking among the National Shows in importance it is forecast that it will be as well attended as either of the big shows already held.

As in previous years, Mr. Chester I. Campbell will be the manager and the show will be held in the Mechanic's Building.

So great has been the demand for space that all the booths were engaged over a month ago and there is a long waiting list.

In general arrangement the displays will be the same this year as last, this show being an exhibition of cars, trucks, tractors and accessories.

The Mechanic's Building in which will Be Held New England's Biggest Automobile Show.

A LEAKY radiator is one of the meanest things to repair and one of the most expensive. For those reasons, various radiator compounds have found ready sale. The only objection the writer has to these is the fact that in certain cases by the time enough has been put in to cause sufficient to accumulate at the hole and plug it up, a still greater amount has been deposited in other sections where it cuts down the radiator's efficiency. The compound has no brains, therefore it goes where the circulation carries it which, only by chance, is where the leak may be.

There is an excellent repair open to the car owner if he knows it. It is to apply an exterior "patch" of a material that has been used by roofers for years. This is a plastic substance resembling tar in appearance and smell. A bit of this the size of a common marble will repair a dozen leaks an eighth of an inch square. In roofing work, it is equally waterproof and adhesive to slate, tin, paper, copper or shingles—it never gets hard and it doesn't loosen up under vibration. The writer has tried this under extremes of cold and heat and found it to be the best radiator repair made on the car. This material is sold under such names as "stormtite" and the like though the amount needed is so small that any dealer you know will give you enough for one trial.

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Automobile House Cleaning

Now Is the Time to Go Over the Car and Put It into Condition for Next Season

By J. L. Thomas

NOT enough emphasis has been laid on the motorist's cleaning house—his automobile. I have an old darkey whose method is to sweep litter into a corner, preferably under a couch or behind a door, but anywhere in a pile, "jes' to be handy to take up anytime, sah," he explains. But only when extra force is brought to bear on him does he take it up.

So with much automobile house-cleaning, and the force brought to bear is usually an accident. Some motorists are proud of the cleanliness of their cars—most of them, for that matter. They like to see the fenders and bodies well polished and the nickeled parts bright and clean. That's what shows, what people looking on admire. Other parts, out of sight, they are lax about. Cleanliness and shine are for the eyes, and the eyes don't see underneath. So it doesn't matter.

So they say, and probably think.

But good automobile housekeeping demands cleanliness that is thorough, and which extends to the nooks and corners under the hood, around the engine, transmission, brakes, and other working parts. Such cleanliness has a much deeper meaning than the mere satisfaction of having things clean and attractive. It has to do with the life of the car and its continued satisfactory performances, with safety even. If the motorist will view it in this way, the question of under-the-hood cleanliness looks different.

Drip Pan Usually Neglected

Doubtless the most neglected part of the average motor car is the drip-pan under the engine. If a little oil is spilled in filling the crankcase, few people will stop to wipe it up. Down it trickles into the drip-pan, the first of a series of such overflows to happen as long as the car is in use. But if some of the oil is spilled on the apron, or fender, it is industriously wiped off, simply because it is exposed to view. The purpose of the drip-pan is not to catch oil and dirt. It is put there to protect the engine and other working parts from foreign matter that could otherwise get in from below.

When you drive along a country road after or during a rain, mud and water are splashed up unavoidly on the under side of the fenders, body and chassis; and if it were not for the drip-pan these advance agents of rust would settle around bolts and nuts and corners of the frame, and would sooner or later find its way into the working parts. So the term "drip-pan" is really a misnomer, because it gives the impression that the pan is there to catch oil or anything else that might fall into it. But such substance should not be allowed to collect in the pan, because permitting them to do so defeats the very purpose for which the pan is designed.

Right here the "let well enough alone" ask, "What harm will it do to let these things accumulate?" They would be able to answer their own question could they see what happens. After the car has been used for several months, considerable oil has probably been allowed to drop into the pan. At first it spreads out in a film over the surface, and in the act of driving, dust settles upon this film, changing it to a sticky, non-drying mud, which process continues in spite of the drain hole in the bottom of the pan.

Pan Drain Clogged

Frequently it happens that in cleaning under the hood, rag or bit of waste is dropped into the pan. Instead of removing it, the tendency is to let it go, with the result that it may become lodged in the drain hole and stop it up entirely, when the excess of oil would have not outlet. Of course, oil itself is a lubricant and will not damage any of the working parts.

But oil mixed with dust and foreign matter that is bound to collect in it is nothing short of an abrasive material, and no chances should be taken of getting any of it into the crankcase or any other part of the mechanism. And if the drip-pan of a car is permitted to be the gathering place for refuse of this kind, it might as well be left off the car entirely.

There is a very simple remedy. The drip-pan should be cleaned as religiously as the rest of the car. Any overflow of oil or gasoline should be wiped up before it gets a chance to run down into the pan. See that the drain hole in the pan is not only stopped up, but has no accumulation around it that will interfere with the free draining of the pan. The design of this pan is such that it can be removed for an occasional cleaning, and no matter for what purpose it is removed, it should never be replaced without first cleaning it thoroughly.

There is nothing more unpleasant to the average person than working about under the hood of a car where everything is covered with grease and dirt. For this reason, many people make a practice of cleaning the motor off occasionally with gasoline. This should never be done—always use kerosene. Then, instead of finishing the job, they will let the dirty oil drop into the pan and stay there. A few minutes longer would suffice to rinse out the pan as well. But you can look under the hood of many cars and find the accumulation of oil and dust so thick that is is impossible to touch any part without soiling the hands or clothing, in spite of the fact that the exterior of the car is clean and inviting.

The easiest and best way to keep the drip-pan and all

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other parts under the hood clean is to be regular about it. Don't wait for a lot of foreign substances to gather and then make one job of it. Whenever the car is lubricated or washed, see to it that a little interior cleaning is done as well. Don't permit overflow of oil to go unnoticed. The car owner who buys his supplies at a filling station should see to it that the attendant wipes up any oil he may spill, and if this practice is followed regularly there will be no chance for a collection of such refuse in the drip-pan.

As already mentioned, the pan may be removed for cleaning if it has been allowed to go for a considerable time without attention. A stiff brush dipped in kerosene oil will remove the grease and dirt quickly, if it is not too thick. If it is, first scrape off the thickest part with a piece of wood or some convenient instrument, and then apply the kerosene with a brush. While the pan is off, it is well to go over the motor in the same way, at the same time cleaning the corners around the frame, etc.

In this way the owner is assured of perfect cleanliness that is not in any sense a detail, but is really important in the everyday service of his car and makes it that much more fireproof.

Nuggets of Automotive Wisdom

Hints, Suggestions, Facts and Helpful Information Gathered by An Expert for Your Aid

By Joe Bell

The Cars of Yesteryear.

"THEY don't make them as good as they used to," say the wiseacres in speaking of automobiles or garden tools. Of course the great American flivver comes in for a rub too. It is from the careless words of these witness persons that many an article gets a black eye; without knowing facts or going into the merits of an article, these guessers take pessimistic shots to hear their own noise and the shots echo throughout the length and breadth of the land in the form of Mrs. Grundys.

Yes, it is true that the 1921 Joyride 6 isn't as heavy a car as its predecessor, the 1917 Joyride 4, and probably it won't stand quite as much in the way of being used as a battering ram but it will run more miles on a gallon of the kerosene we get to-day than the old car would on 76 proof gas and to-day we have the satisfaction of buying fuel to carry ourselves around, not to move three or four hundred pounds of useless weight.

And we are riding faster than we used to. If we are out for pleasure and health, our range is thereby doubled —if we use the car for business, we can cover twice as much ground, which is another way of saving time—and the laborer's time is now priced above a dollar an hour. Another thing—each year sees the cars more reliable, sees them in the hands of less mechanical persons who can operate them successfully—this itself is a triumph of engineering, as the number of cars on the road multiplies by leaps and bounds; the number of roadside repairs to be seen diminishes in reverse proportion.

Indeed, they built those old cars strong, all right enough, in the good old days—strong and slow and heavy and hard riding; they don't make them any more and now we have to take them as they come—economical but light and speedy but comfortable.

Newly Richedness Rewarded

THE State road down below Greycourt was pretty badly torn up for repairs and cars got by with difficulty. During the spell of wet weather, the laborers camped on the job and whenever the downpour let up for half an hour they dug away with commendable zest.

During one of these let-ups, a handsome touring car was negotiating the bad section, a liveried chauffeur driving and a stupid looking man occupying the rear with an overdressed wife beside him. A group of laborers were struggling with heavy boulders in the mire of the ditch and as the car passed, the man in the rear rose from his seat and called out, "Work, you suckers, I used to be poor myself."

This wholesouled remark, coupled with the uncertainties of the road, so upset the chauffeur that he got out of the path entirely and into the ditch on the other side. All his efforts to drive out failed—the car was in for fair. Then the fond owner stepped out and went back to the gang at work to ask for assistance. Needless to say he didn't get it and he waited for six long hours until a repair crew finally extricated it. The foreman of the gang told me that he frequently took his men and trucks to help out stalled cars and was glad to do it without charge, but that in this instance he shared his men's feelings that one car owner needed a lesson.

Reversing at 20 Miles an Hour

THE conversation had turned to Winter driving and whether in descending an icy hill, sliding wheels or wheels moving just enough to keep from sliding were most effective in braking. One man said that if he had to descend such a hill, he would put his car in reverse, hold the clutch out until the car was moving sufficiently to keep it going, and then carefully let the clutch in. His claim was that wheels turning backwards would

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have greater retarding effect than locked wheels; and the consensus of opinion in the group was that this was true, and also that no data on the subject was available.

Another man spoke up, saying that he would like to be able to get in reverse under such circumstances when he was going from fifteen to twenty miles an hour, that he had been on roads where such a possibility would have made his descent much safer, adding, "but I know this is an impossible shift without cleaning out the transmission."

A third member of the group came forward. "No it isn't impossible on ice if your brakes are evenly set; what's more I will go up on High St. in this rain and show you that I can do it on that slippery surface. What you have to do is lock your wheels, shift to reverse, and let in your clutch. You have to think and work quickly and you have to be going at a good clip and that on a slippery surface where the locked wheels do not affect your forward speed immediately. When the wheels are locked, the transmission is in a state of rest and you can get into any gear you choose. I used to practice this merely as a stunt when driving on the ice of the Hudson River."

How to Fit Spring Bushings

CAR OWNERS who do their own work and garage men who have no machine tools have been more or less troubled in putting new bushings into spring eyes. Worn bushings and spring bolts make any car seem old —new ones are cheap enough and easily put in, so everything goes along lovely until it is discovered that the new bushings are too large for the hole. Every layman knows that a bushing has to be a few thousandths larger than the hole in order to squeeze in and hold itself securely in place—but when it comes to a thirty-second or a sixteenth, that looks like too much.

The hole in the eye of a spring is made by blending the main leaf in circular form at the end, while the spring is hot. This makes a hole that is approximately round and that has a "break" all the way through where the free end meets the flat leaf—but the hole is nearly round enough and continuous for all practical purposes. Instead of reaming out this hole to better form, common practice forces the bushing into it, letting the soft metal conform to the shape of the spring, and finally reaming out the inside to true roundness for the spring bolt. This is the reason why any bushing up to a sixteenth large may be made to go.

If there is a lathe or drill press where the bushing may be filed or turned, use that—if not, put the bushing in the vise and with a coarse file taper one end as well as your skill permits. Carry this taper back about half the length of the bushing, starting from a diameter at the end that will enter the eye of the spring. Smooth out the spring hole at one end so there are no sharp edges to tear, put oil on the bushing, start the pointed end in the hole, and squeeze it home. If there is no press, this squeezing may best be done in the bench vise—if there is no vise, do it with a block and heavy hammer BUT in any case, see that the bushing is started straight.

After being pressed in, the hole is reamed or drilled or scraped to fit the bolt. Should the bushing, through some error, be an eighth of an inch large, it will have to be turned down at a machine shop but within the limits named above, any owner can fit his spring bushings if he has a vise and a file. It is a well known fact in shop practice that a bronze bushing can only be made so tight, that is, a bushing .035 of an inch large will actually be no tighter than one .005 of an inch large when pressed in the same size hole because the metal squeezes up when a certain pressure is reached and as there is a hole in the middle, the metal goes there; if the .035 of an inch bushing were taken out after pressing in, its diameter would no longer be .035 over but something like .005 of an inch large.

EVERY one says, "if I knew which way that cotter hole ran, I could get the pin in easily enough, even if I can't see in there where the nut is." Next time, when the bolt is out, make a file mark or a scratch across the head in line with the hole, then notice how readily you get the cotter in.

THE MEMBERS of a military band were making the trip to a nearby city by auto, there to take part in some celebration. A trifling accident at the start deprived one of the cars of its horn. This little matter caused the owner no worry; he merely shifted his passengers so that the trombone player was on the front seat beside him, "Now Dave, you get out your horn and give 'em a few staccato notes when anybody gets in our way," he said. And Dave did so, to the end that there was no delay whatever in threading the car through the ever increasing number of vehicles that were making their way to Poughkeepsie for the gala day. A couple of notes, "cracked" as only the trombonist can do it, or one of those slippery slides for which the instrument is famous never failed to bring action from the pedestrian or the car ahead.

IT is bad practice to run a bolt in a dirty threaded hole, it is a mean job to clean such a hole unless the part can be flushed out. Filing over a threaded hole is a frequent forerunner to such a cleaning job. One way to clean the hole is to run a tap in it. Another is to swab it out with a bit of waste on a file tang. An unsatisfactory way is to crowd waste into the hole before filing. A good way is to put a headless screw into the hole, just below the surface being filed—the screw carries the filing out with it when it is removed. An entirely different method is to place the work so the filings cannot fall into it—this is applicable to light filing, smoothing up, etc.—the work is held so the surface being filed is vertical.

Nervous Piano Salesman (*formerly a department store clerk*): Shall we send it for you?

—*Boston Transcript.*

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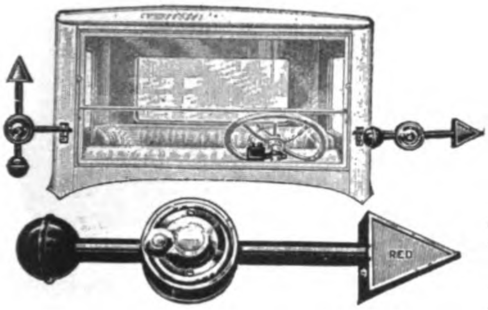
New and Useful Automobile Accessories

"Hankee" Signals

The Naser Electric Company, Minneapolis, Minn., who is marketing the "Hankee" Signal, claim it to be the only all-electric Safety Traffic Signal for automobiles and trucks possessing all of the following features:



Visibility for a great distance from the *front* as well as from the *rear;* visible day and night. Operate in clear view of the driver. Located where other drivers are looking for hand signal. Away from mud and dirt. Dust or snow do not render them less visible. Operated by patented electric motor in central housing of signal, by instantaneous push of a button conveniently mounted on the steering column. Installed like a spotlight. All wiring under dashboard.

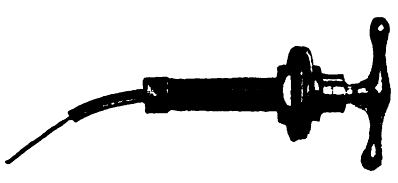
No mechanical gears or levers. No current used by motor while signals are either at rest or in signalling position. No drain on battery. Current used about 12 amperes for the second only that the button is pushed. No wearing parts, nothing to adjust. No rattle. Two candlepower lamp in arrow head easily accessible for renewal. Left signal makes economic parking light.

Readers who are interested should write to this company for any further information that they require.

A New Cooper Product

A patented dash control for muffler cut-outs, air chokes, radiator shutters, heater valves, etc., is a new product of the Cooper Mfg. Company, of Marshalltown, Iowa, makers of the famous Cooper Special Cut-Out.

This dash control is a beautifully nickeled device installed by boring a single half-inch hole in the dash. It is operated by pulling on the "T" handle and locking



it in any position by a slight twist. Its handiness and convenience is evident, for it places the control where it belongs and leaves the floor-board of the car free for removal without disconnecting the device.

Duro Plates

We call the attention of our garage and repair men readers to the announcement by the General Lead Batteries Co. This company are in a position to furnish replacement plates for any type of batteries. These plates are of the straight bar grid type and are of the same high-grade materials and workmanship as used on their regular batteries.

The Tel-Auto-Spark

A device which, the manufacturers claim, is a perfect indicator of all engine troubles is being sold under the trade name of "Tel-Auto-Spark."

This device consists of a small glass indicator which is attached to the dash. The markings are radium covered so that they may be read in the dark. This indicator is connected directly with the spark plugs.

Such is the construction of the Tel-Auto-Spark device that any trouble with the ignition system or carburetion is instantly reflected. The action of the unit shows whether the plugs are receiving proper current, whether that current is of the correct strength or not, and indirectly, the action of the mixture.

The Tel-Auto-Spark Co., Pontiac Building, St. Louis, Mo. are the manufacturers.

The Excellight

Our readers will surely be interested in the Excellight, a new product being marketed by the H. B. Shontz Co., Inc. of 161 West 46th St. New York City. This device is to take the place of the old fashioned gasoline or oil lantern.

The Excellight is operated by means of a battery, which can be replaced easily and at a small cost, when it is discharged. The lantern, having the lighting unit inclosed, will not ignite gases or explosive fuels and should be of great value to the garage or repairman.

The R. R. G. Wheel

Something new in the form of demountable wheels is being made by the American Non Ferrous Metals Corporation of 113 Union St., Elizabeth, N. J. The R. R. G.

wheel as this product is called is first, a demountable wheel, being removed from the car by taking off the hub cap and wheel lock, an easy operation.

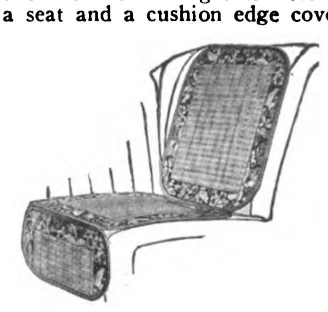
Once the wheel is removed the locking nuts on the rim are taken off in much the same way as are the ordinary nuts on a demountable rim. This being done the wheel separates laterally into two parts, hub, rim and spokes so that the tire can be removed without any other tools.

The whole proposition is simple, practical and easily operated and deserves investigation on the part of our readers.

Evr-Klean Seat Covers

The Wedford DeLuxe Evr-Klean Seat Covers, made by the Wedler-Shuford Co. of St. Louis, Mo. should be interesting to every reader who is contemplating the saving of the upholstering in his automobile The standard type of so called "slip covers" not only cost money, but, in many cases must be applied by an upholsterer. This is not the case with the Evr-Klean Seat Covers.

The Evr-Klean covers consist of three pieces of imported, rice straw matting, flexible, strong and durable. Each piece is faced with a 2½ inch strip of high grade khaki material. The reverse sides are covered with heavy material and then bound to make the parts into one unit. The three parts are then sewed together forming a back, a seat and a cushion edge cover.



The covers may be held in place by means of snaps or buttons, a set of fasteners being attached to each set of covers.

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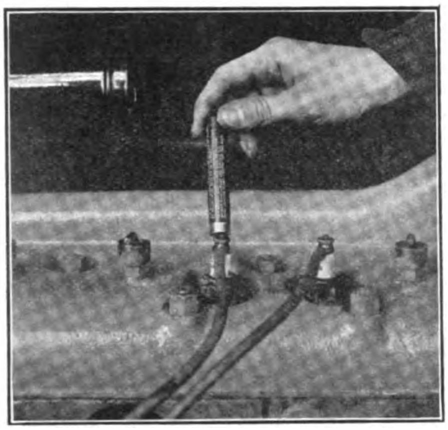
The Airco Ignition Gauge

Neon, one of Nature's rarest gases, is being used to help the motorist of to-day. Neon is present in the air we breathe to the extent of one cubic inch for every 100,000 cubic inches of air.



One of the characteristics of neon is its electrical conductivity; it is such that a spark, strong enough to jump one inch in air, will jump 75 inches in Neon gas. A second characteristic of this gas is its luminous action when electrified.

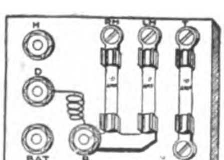
These two characteristics have made the Airco Ignition gauge practical. The Airco gauge, made by the Air Reduction Sales Co. and sold by Edward A. Cassidy Co. Inc. of 25 West 43rd St. N. Y. City, is a compact, rubber covered device which resembles a fairly large fountain pen. A slot in the side discloses the tube of Neon gas and one end of this tube is connected with a ferrule on the end of the device.

By placing the end of the tube against a secondary wire of high voltage current the Neon gas becomes luminous. The stronger the current, the more luminous is the gas. By using the device in conjunction with the ignition system it is an easy matter to locate practically any kind of ignition trouble.

New Device for Protecting Ford Wiring

Burning out of the wiring on Ford cars, due to grounds, has been the cause of considerable trouble and expense to Ford owners. It has often resulted in the necessity for entirely re-wiring the car and even caused some fires, to say nothing of the annoyance of being deprived of lights when some distance from a Ford garage and being unable to purchase the right type of lamps in the ordinary garage.

A way to remedy these troubles seems to have been found by the Chicago Fuse Mfg. Co., of Chicago, with an inexpensive



device called the "Union Fuse Junction Block." This is installed on the dash and acts as a safety gate between the power plant and the wiring. When equipped with this block, a small fuse blows out when there is a ground and thus prevents injury to the wiring or the lights. A new fuse can then be quickly replaced at a small cost and the wiring system is as good as ever.

Burke Retainer

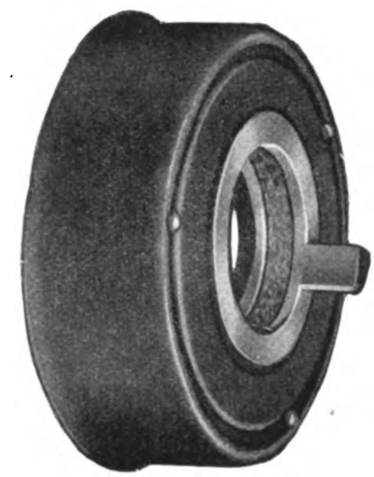
The Burke Manufacturing Company, Dayton, Ohio is putting on the market a grease retainer for which the claim is made that it will positively stop the leakage of grease on the rear axles of Ford cars.

This new retainer is as simple in construction as it is practical in use. It is made of accurately machined parts of bronze and steel with a non-absorbent cork packing that insures a tight and permanent leakproof job.

One of the features of the Burke Retainer is the center bronze sleeve which floats with the side play of the axle. Another exclusive improvement is the lug which fits the keyway of the wheel to keep the sleeve turning with the axle.

With the use of this retainer the grease is said to be shut within, not away from, the bearings, and to allow the differential gears and bearings always to be flooded with the lubricant, at the same time keeping the brakes and tires dry.

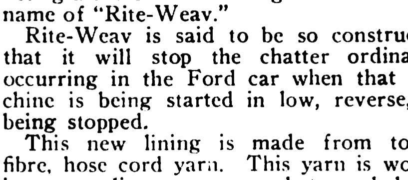
It is easily and quickly installed and no special tools are required, nor does it in any way change the standard Ford construction.



It is sold by the manufacturers on an absolute guarantee that it will do the work regardless of the condition of the car on which it is placed.

Rite-Weav Transmission Lining

The Libby Manufacturing Co. of 111 Watchung Ave., Plainfield, N. J. are mar-



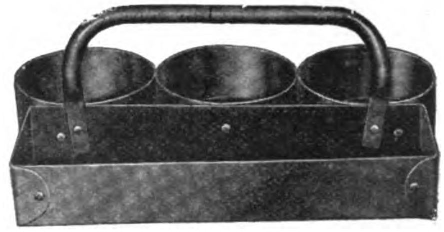
keting a transmission lining under the trade name of "Rite-Weav."

Rite-Weav is said to be so constructed that it will stop the chatter ordinarily occurring in the Ford car when that machine is being started in low, reverse, or being stopped.

This new lining is made from tough fibre, hose cord yarn. This yarn is woven in a peculiar manner and treated by a secret process so that it will resist the action of hot oil. The special weave is not only for long wear but also for smooth action.

Powell Metal Cups

The Powell Muffler Co. of Utica, N. Y. are marketing an article which will appeal to our garage and machine shop readers; we refer to the Powell metal cups.



These metal cups are made from 18 and 20 gauge steel, two inches deep and oil tight. They can be used for storing small parts such as screws, nuts, bolts, etc., either in bins or for carying the parts to and from a job.

The cups are made in three sizes, 5, 6 and 6½ inches in diameter and may be had riveted into groups of 12 or more as desired.

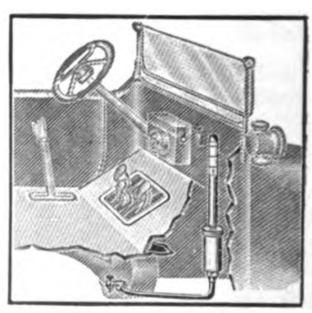
The Reeps Dashboard Oil Gauge

There have been a number of worthy devices made for indicating the oil level in the crank case of the Ford car, but the Reeps would seem, on analysis, to have a few features which would recommend it especially.

The Reeps dashboard oil gauge, made by the Reeps Mfg. Co. of 30 Church St. N. Y. City, is a device which is attached to the crank case and projects through the toe board in such a way that it is practically against the Ford dash board.

When installed, the device is visible from the driver's seat and will show the exact amount of oil in the engine base. It is made entirely from brass and aluminum, with a cork float; hence there is nothing to rust or cause trouble.

The installation is simple. The lower drain cock is removed and a T fitting put



in its place, then the drain cock replaced in the T fitting. The other leg of the T is connected with the oil gauge and the latter fastened to the dash with a strap clamp. The small hole in the toe board can be cut with a chisel or knife, this being the only change necessary.

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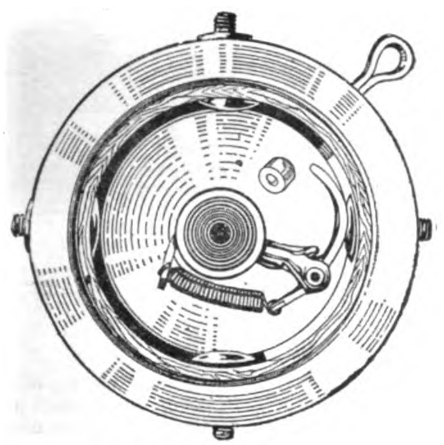
The Hy-Power Timer

The Benford Auto Products, Inc. of Mount Vernon, N. Y. have added to their line a timer with a unique principle. This new timer, which is termed "the Hy-Power" is a radical departure from the old style of roller timer used on the Ford car.



In the Hy-Power timer the roller contact is replaced by a steel arm which carries a curved steel lever and this member is held in position by a coil spring.

The curved steel lever, which is the contacting member, slides around the inside of the timer housing and makes a positive connection with the electrodes.

The terminals, or electrodes, instead of being flat and conforming with the contour of the housing are oval. This means that the sliding contact must pass over each electrode, even though the camshaft is not quite true. The whole unit is made interchangeable with the present Ford timer.

New H & G Socket Wrench

The Eastern Machine Screw Corporation, New Haven, Conn., manufacturers of the well known H & G Self-opening Die Heads, are placing on the market a new socket and ratchet wrench set, designed to meet the demand for a wrench set possessing strength, practicability and finished appearance.

The manner in which the sockets are made is one of the features of the set. The hole for the hexagon in the H & G socket is drilled to diameter of the diagonals—the distance from corner to corner—a considerably larger hole than that used in the broaching process. The metal is then drawn in to form the hexagon which condenses and toughens the metal.

The head of the socket is a hexagon and the various units of the set fit over this head.

The sockets are heat-treated and hardened by a special three-stage process. First, carbonization, Second, refining, Third, hardening. Exceptional strength and durability is claimed for the sockets. Special care is taken to have the sockets fit the nuts accurately.

The set is packed in an attractive hardwood box with a place for each part and consists of ten sockets, an adjustable T handle, reversible ratchet, extension piece, universal joint milled from bar stock, and two screw drivers. All of these units are specially heat-treated, hardened and finished. A dropforged box wrench, hardened by the cyannide process, is also included for use where head room is not sufficient to allow the use of the other tools.

The Roffy Spot-Light

Something new in spotlights is being manufactured by the Standard Corporation of Columbus, Ohio. This new spotlight is equipped with a mirror glass reflector of the return-ray type. The glass reflector is made by a special process, blown to the precise geometrical curve necessary for good reflection.

The reflector is then silver plated and has all of the qualities of a good mirror. Such is the construction that the direct rays from the filament are obscured and only the indirect rays are used.

The light projects a soft, but penetrating beam for a great distance. The makers claim that it will project through fog or mist without the attendant annoying "back-glare" so common in high power illumination.

With the lamp is furnished a 360 degree universal ball and socket bracket, a 27 c. p. frosted tip bulb and five feet of flexible cord. A quick detachable feature permits the use of the unit as a trouble lamp.

The Ransome Reamer

Of all tools which have been improved in the past few years the reamer has advanced the most. The older types of solid reamers gave place to those with replaceable jaws and of late the expansion reamer is being extensively used in automobile work. Many repair men favor the reamer over scraping methods for bearing work.

One of the latest innovations is the cylinder reamer and we call our readers' attention to the Ransome parallel expansion reamer made by H. A. Hopkins & Co., Inc., of 247 La Porte Ave., South Bend, Ind.

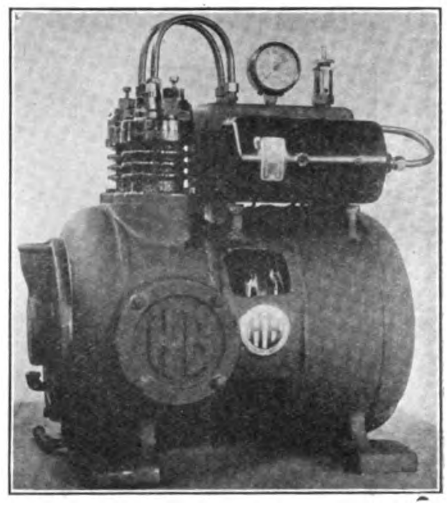
The Ransome reamer is made in five sizes to cover a range of cylinder bores from 2¾ to 4 inches. Each size has an expansion range of ¼ of an inch.

The reamer is extremely simple in construction being made from but three units, the main body, the nut and the jaws. The main body is slotted to carry seven blades and the slots are of a "T" shape with the top of the "T" toward the center. The blades are machined to fit the "T" slot and this construction is said to obviate any chance for chatter.

The nut end of each blade carries a lip which locks it into the nut and prevents slippage which might result in an oversize. Each blade is sharpened in such a manner that it "cuts" rather than "scrapes." The nut is provided with a micrometer adjustment with graduations to .001 of an inch.

H B Heavy Duty Compressor

A two cylinder, high pressure, Automatic Air Pump has been brought out by Hobart Brothers Company of Troy, Ohio.



The outfit is unusually compact and furnishes 6 cubic feet of air per minute. It is said to be especially designed for the oil station or garage where space is limited and quiet operation is appreciated. It maintains pressure, if desired, up to 300 pounds automatically on the air lines.

Equipped with Ball Bearing 2 H. P. Compressor-type Motor, oil and moisture filter, safety valve, gauge, automatic switch. Dependable splash lubrication is used and the single unit construction (Motor and Pump built in one frame) is claimed to insure economy of operation and freedom from breaking belts.

It can be compactly mounted on tank if desired and instant motor start with practically no load is claimed. Further information may be obtained by writing to the manufacturers.

Kendell Piston Rings

Kendell Piston Rings have many scientific and mechanical features which are attracting attention throughout the field at the present time. They are of a new type, termed 'even-radius'—type having even wall pressure at all points, this being derived through a special returning process, producing a point of expansion every 30 degrees on the entire circumference, thereby eliminating 'burning spots' that invite compression leakage. They are also provided with a non-clogging oil wiper at the bottom of the ring.

Kendell piston rings are of two-piece construction, an inner or expansion ring and an outer or packing ring, which is of softer metal, having a rapid seating feature. They are both cut on a 55 degree angle, thereby relieving groove pressure and increasing pressure on the circumference, lengthening the life of the expansion ring.

After extensive tests it was made possible to produce a simple, durable and efficient piston ring with a number of entirely new features; eliminating deepening of ring grooves, drilling of pistons, oil regulations, springs or pins that have to be replaced. These features are said to be embodied in Kendell Piston rings.

Kendell piston rings are backed up by the manufacturer with an absolute money-back guarantee. For further particulars address Kendell Engineering Company, Fort Wayne, Indiana.

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Packard Balls for Front Wheel Bearings

A new packaged product, Atlas Auto Balls, manufactured by the Atlas Ball Company of Philadelphia under the supervision of S K F industries, Inc., is meeting with widespread interest.

The Atlas Ball Company, pioneers in the production of quality steel balls, is now taking another progressive step by placing on the market quality steel balls in the most convenient form for repairmen, dealers and individual car owners.

Just the right number of hardened chrome steel balls of the proper size to fit cup and cone bearings of any particular car are packed in a wooden container which is sealed against moisture. Each ball is coated with a preserving film of grease which prevents rusting and pitting and insures a perfect surface when the ball is finally placed in the bearing. All balls are gauged to extremely close limits of accuracy to that every ball carries its share of the load and most rigid inspection is followed to insure freedom from cracks, imperfections and soft spots. The containers are packed in sets in cartons for dealers, each carton making an attractive package which shows the product to advantage in windows or on counter display.

Sizes are now supplied for Fords, Chevrolets, Buicks and other makes using cup and cone bearings.

New Chicago Manager for Multibestos

Announcement is made that Mr. Andrew Scharff has been appointed Chicago Branch Manager for the Multibestos Company, Walpole, Mass., manufacturers of Multibestos Brake Lining and Multibestos Clutch Lining.

Mr. Scharff was formerly Minneapolis District Manager for the Multibestos Co.

Standard Foot Accelerator

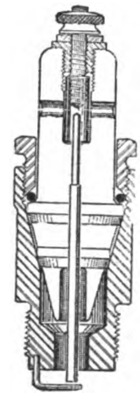
The Allen Co. Inc. of 23 Broadway, Camden, N. J., are marketing a device which will doubtless please many Ford owners. This device is called the "Standard Foot Accelerator," and as the name indicates is intended for application to the Ford carburetor throttle, thus adding a foot throttle to the equipment.

Those who have driven cars fitted with foot throttles, or accelerators, will appreciate the fact that the foot control is far more satisfactory than the hand. The hands should be used only for steering, it is enough for them to do.

The Standard Foot Accelerator can be applied by anyone since it requires no machine work, beyond the boring of the hole in the floor board.

The Duro Spark Plug

A spark plug with a number of unique features is being made by the Duro Company of 96 North 15th St. The plug is unique in that it differs widely from standard design.



The porcelain is cupped out at the top and carries an adjustable spark gap, surrounded by a glass covering to protect the spark from gas fumes. The gap is adjusted from the top by turning the lock nut and the center electrode.

A second feature of the porcelain is its beveled construction where it fits into the steel shell. The porcelain, at this point, is constructed in much the same way as the ordinary gas engine valve and has two faces which seat into the shell. These faces are ground into place and thus form a gas tight joint. The gasket is proved simply to take care of the expansion.

The gas pocket, or firing pocket in the plug is cut down to a minimum in order to lessen, as far as possible, the compression chamber space.

Such is the construction that the porcelain may be taken from the plug for cleaning, without removing the shell from the engine. It is claimed that the porcelain can be replaced without disturbing the electrode adjustment.

Pedrick Piston Ring Pliers

Piston rings may now be installed quickly and easily, positively without danger of breakage and distortion.

A tool which is said to grip and spread a piston ring in one operation and make it possible to place and remove rings in one-tenth of the time it ordinarily takes, has recently been placed on the market. The rings are caught in the jaws of the pliers, and by pressing the handles together are spread in a natural way sufficiently to slip over the piston and to be placed in their proper groove.

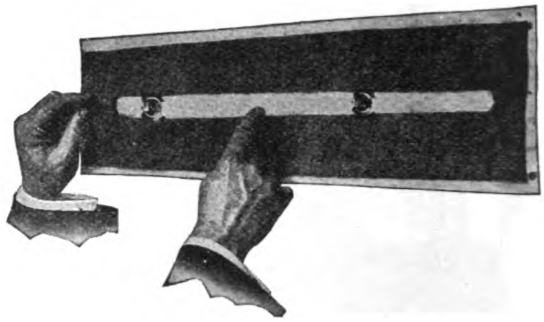
In the end it is claimed to more than pay for itself because of the expense saved in not buying extra piston rings to replace those so often broken during their installation.

Pedrick Piston Ring Pliers are being marketed by the Wilkening Manufacturing Company, Philadelphia, Pa., makers of Pedrick True-Fit Piston Rings (patented) and Pedrick Oil-Control Piston Rings (patented).

Jobbers and Sales Agents are invited to correspond, addressing all inquiries to the Tool Division.

Reliable Spring Oilers

The subject of proper spring lubrication has been forcibly brought home to car owners, by the Reliable Spring Oiler Co. in a recently issued folder wherein they ask,—"Why Not Use Sleighs in Summer?" It is a most effective piece of publicity and is bound to make automobile owners think.



They claim that the reliable spring oilers provide a means of Spring lubrication and protection of unusual importance to every car owner. They are made of a special grade of heavy canvas, thickly coated on one side with a waterproof preparation which makes them impervious to bad weathe Two heavy felt pads of a special shape are attached to the inner side so that when the oilers are wrapped around the automobile spring these felt pads lap over and extend down the side of the spring while the waterproofed cover completely envelops the spring, thereby preventing rust and erosion which naturally follows as a result of driving cars in all kinds of weather.

The top of the oiler is equipped with self-closing oil caps, which are placed at frequent intervals to permit the easy application of oil. As the oil is poured into these openings it runs down along the top of the spring and gradually saturates the felt pads, thus keeping the top and side of the spring constantly enveloped in oil which means that the natural movement of the springs practically results in automatic lubrication.

This combined protection and thorough lubrication naturally results in greater resiliency and easy riding comfort while also adding life to the spring.

Reliable Spring Oilers are made to fit all makes and models of both automobiles and trucks. The common sense practicability of this product is making it widely and popularly known through the automobile world, resulting in an ever increasing demand for Reliable Spring Oilers.

The manufacturers have worked out a unique sales plan which practically makes it unnecessary for Jobbers and Dealers to carry more than a very limited stock. This, of course, will be welcome news to the Trade and is sure to make Reliable Spring Oilers popular with both Dealers and Jobbers. Full particulars of the plan can be had by writing direct to the Reliable Spring Oiler Company, at Columbus, Ohio.

Removal of Hauck's Philadelphia Office

The Philadelphia office of the Hauck Manufacturing Company, manufacturers of portable oil burners, torches, furnaces, etc., has been moved to 1726 Sansom Street, Bell 'phone Spruce 5626.

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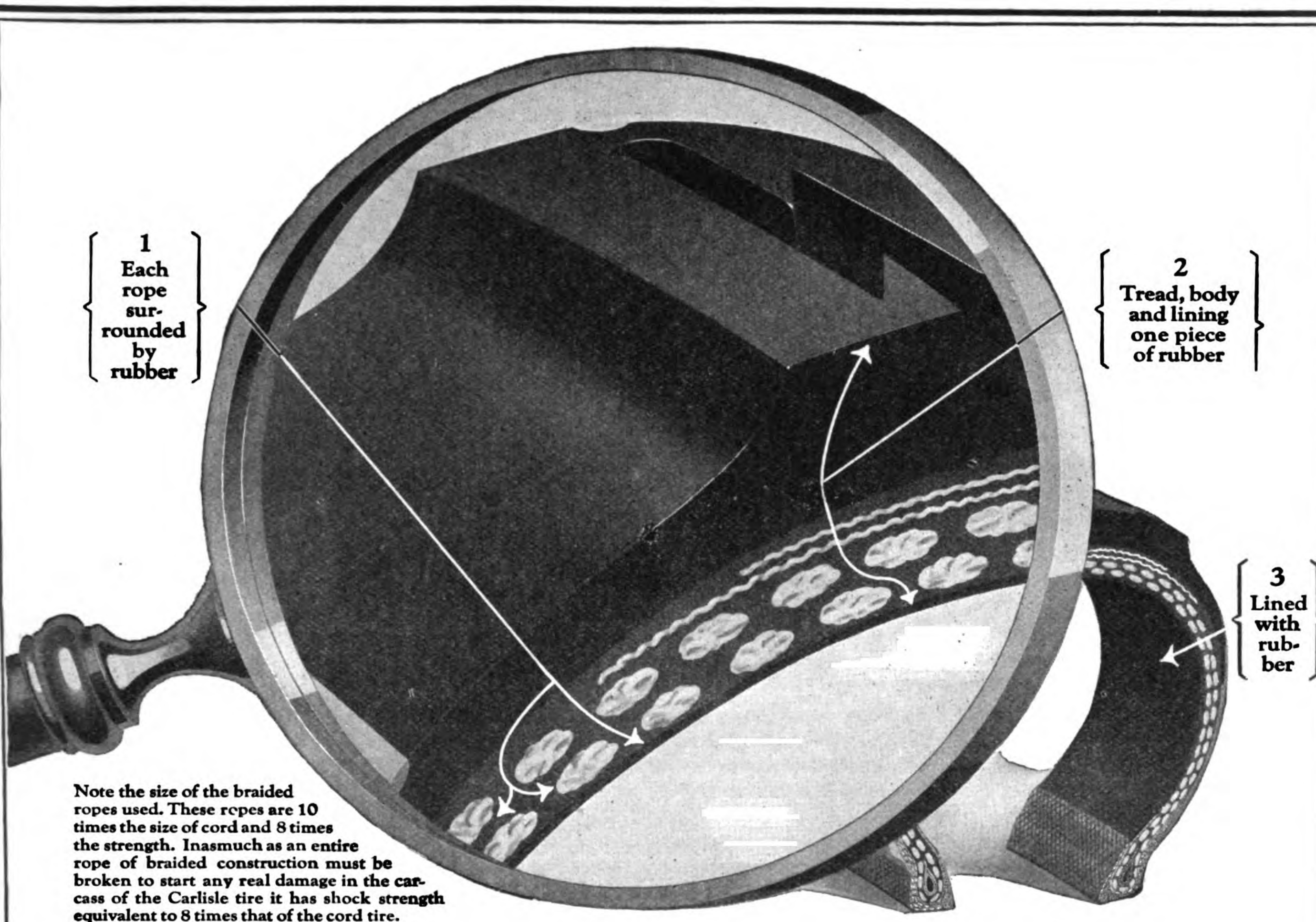

Why a *Cool* Tire is a *Better* Tire

Do you know what causes a blow-out? Do you know that your tires really wear themselves out from the inside more than from road contact?

At some slightly defective spot in the carcass a cord rubs against its neighboring cord, or a layer of cords against another layer. This rubbing produces frictional heat.

Gradually at that particular spot the structure of the tire is weakened by friction. All of the seven or eight layers of cord, or fabric, are separated one by one because heat burns out the vitality of the rubber. And then one day—the blow-out.

Carlisle ropes are surrounded by a thick cushion of rubber; they cannot rub against each other and generate frictional heat. Note in the illustration above the amount of rubber around each rope. Thus the principal cause of disintegration and the blow-out has been abolished.

Convincing proof that Carlisle tires keep COOL lies in the rubber lining. If this tire became hot in road service, the inner tube would stick to this rubber lining.

Carlisle rope is the greatest single step forward since the first pneumatic was built. Carlisle Rope Tires are built on an entirely new principal of construction thoroughly protected by patents.

You don't know of any other tire that is lined with rubber successfully, do you?

This is but one of the seven fundamental features in tire construction that make—

CARLISLE *Rope* TIRES

"Destined to Revolutionize the Industry"

CARLISLE TIRE CORPORATION · *Stamford, Connecticut*

Carlisle Tires are represented by representative distributors. Let us show you how it will be more profitable for YOU *to handle Carlisles.*

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The Wepplo Reboring Mill

As time goes on the demand for a cheap but efficient machine for reboring engine cylinders increases. Where reboring work was formerly done upon lathes or drill presses, at present there is such a large demand that it is not practical to tie up general machines for the work.

The Wepplo Machine & Tool Co., of 5340 Montrose Ave., Chicago, Ill., is manufacturing a cylinder reboring tool which deserves the investigation of anyone contemplating the installation of such a device. The Wepplo reboring mill is small, simple and complete. It is light enough for portability, yet heavy enough for strength.

The main body of the machine is faced off to fit upon either the top or the bottom of an engine block as the case may be. Slotted clamps and fittings adapt the casting to any type of cylinder. The main body carries two large and heavy bearing journals for the boring head.

Franklin Portable Repair Shop Unit

One of the machines, particularly interesting to repairmen and garage men, exhibited at the New York show was the Franklin portable repair shop unit, a precision machine. It is safe to say that no machine exhibited was so flexible or had so many uses.

One might well remark that this machine is "indispensable" since its price is well within the reach of the average garage owner.

The Franklin unit consists primarily of a flat square iron bed, about two feet long by eighteen inches wide. On this stand is mounted a small electric motor fitted with a flanged pulley. Upon the same bed is mounted an emery wheel stand. The latter unit is driven by a flat belt from the motor. Beside the emery wheel is mounted a compound feeding bed, similar to the compound tool rest on a screw-cutting lathe. The moving bed may be fed at right angles to the emery wheel face or parallel with it. On this bed may be mounted the accessory tools which go with the device.

For refacing valves, of any angularity, the valve is placed in the refacing device which is then mounted on the compound bed. A split collet, quick acting chuck holds the valve in the head.

A worm, driven from the belt, serves to rotate the valve as that unit is being ground. The valve is fed across the emery wheel by hand.

As an accessory with the device is furnished a set of valve re-seating tools and these tools may be ground in the machine at the same angle as the valve, thus making for a perfect fit.

A special jig for grinding breaker points of magnetos or other ignition devices is part of the equipment.

The refacing tool may be removed from the base and in its place may be mounted a jig for carrying hand reamers. Special stops are provided and the reamer may be fed, by hand, across the wheel at right angles.

The electric motor is fitted with a special clamp and a flexible shaft upon which may be mounted a drilling apparatus.

Special jigs and fixtures are furnished for grinding push rod studs, and other small automobile parts which require refacing or re-surfacing.

Our readers should write to the Franklin Machine and Tool Co. of Springfield, Mass., for details concerning this remarkable machine.

Dominion Asbestos Moves

The Dominion Asbestos & Rubber Corporation, now located at 154 Nassau Street, New York, will move their executive offices on or about February 1st to more commodious quarters at 1780-82 Broadway. They will retain their present store and shipping office at 67 Murray Street, for the convenience of their marine and industrial patrons, but they will remove their stock of automotive equipment lines to their new address.

With their increased facilities for handling their rapidly growing automotive equipment business, this company will extend its scope by the addition of a number of well selected and specialized automotive maintenance lines.

Street's Ideal Motor Oil for Fords

J. D. Street & Company, of St. Louis, have just announced a new oil for Fords which they claim will eliminate all "chatter," which is explained as "that uneven jerking of the transmission and brake bands which cause those nerve racking vibrations whenever the foot pedals are used."

It is explained that the cause of this chatter is not due so much to the wearing out of the brake bands as to their becoming glazed through the use of an inferior grade of oil. When glazed the bands grip the transmission in a jerky manner—they grab and then slip instead of taking hold in a gradual smooth fashion. In order to eliminate this evil, it formerly has been necessary to renew the bands very frequently. This is an expense which is claimed to be saved through the use of the new oil which makes the glazed bands soft and pliable.

It is also claimed that this oil "will lubricate perfectly. stop fouling of plugs, increase compression and power, eliminate oil carbon and, through perfect lubrication, will do away with the greatest annoyance and biggest cause of expense and deterioration in a Ford—the chatter."

After putting a gallon of Street's Ideal Motor Oil For Fords in a Ford crankcase, it is said that the brakes can be jammed on at 30 or 35 miles an hour and the car brought to a gradual but positive stop without the slightest chatter.

This oil is a new addition to the Streett's Ideal Motor Oils. While this new oil is directly the result of a year's research and experiments, it can be pointed out that the 37 years of business in the oil industry gave this company a foundation for this new product.

New Hartford Shock Absorber

A new and improved model of the Hartford Shock Absorber, manufactured by Edward V. Hartford, Inc., of New York City, has just been placed on the market.

It is said that the old Hartford has been developed into a fuller efficiency in the New Hartford. This model furnishes a really efficient spring-control at a popular price about half the former price in fact. It not only controls the springs on both compression and expansion but controls them in the degree of shock energy—the harder the shock, the greater the absorption.

The New Hartford Shock Absorber contains the same basic principles which made the original Hartford so efficient, but in the new model, a tubular drag link connects the arm of the shock absorber with the axle. Ball sockets at each end allow free side play.

When the car hits a bump, the springs are compressed and the arm moves up, localizing the blow in the absorber, which effectually absorbs it and in so doing exerts pressure which controls the spring action. Then, when the reaction comes, this same control again functions and gently brings the springs back to normal, keeping the wheels on the ground, preventing spring breakage and softening the jolt and jar. Because of this construction, the harder the shock, the greater is the resistance to jolt and jar.

There is but one model and it is quickly attachable to almost any car or light truck, thanks to five different fittings, the proper ones of which are included with the shock absorbers. A very few cars require one or two extra brackets for which a slight additional charge is made.

The new Hartford is being merchandized through exclusive distributors. These are being appointed as rapidly as possible so as to be ready for the anticipated increase in business this fall. It has been the experience of the manufacturers that the average jobber is not in position to successfully market a device requiring attaching and service facilities.

This decided change in the merchandizing plan of Edward V. Hartford, Inc., is proving of interest to the trade at large. It is being adopted after much thought, and with the firm belief that exclusive distributors, appointed by the manufacturers, furnish the best method of marketing this accessory. As the initial investment is light and the shock absorbers are easy to attach, the proposition should have a general appeal.

The Handee-Lite

Every reader who has cause to use a portable electric light in connection with the garage lighting circuit realizes the danger from broken or exposed wires. With the lighting cord resting on the floor it is easily damaged. To obviate this trouble the Jas. Fitt Machine Co., Inc. of 114-120 Congress Ave. Rochester, N. Y. are marketing the Handee-Light, as the device is called.

The Handee-Light equipment consists of a reel, and box weighing about 9 pounds. The reel will accommodate 24 feet of weatherproof, flexible cord. To the cord is attached a "trouble lamp" with handle and socket. The cord may be drawn out to its full length and will automatically be rewound as desired, working on practically the same principle as the spring on a curtain shade. The proper connections to the lighting system are made on the reel box itself.

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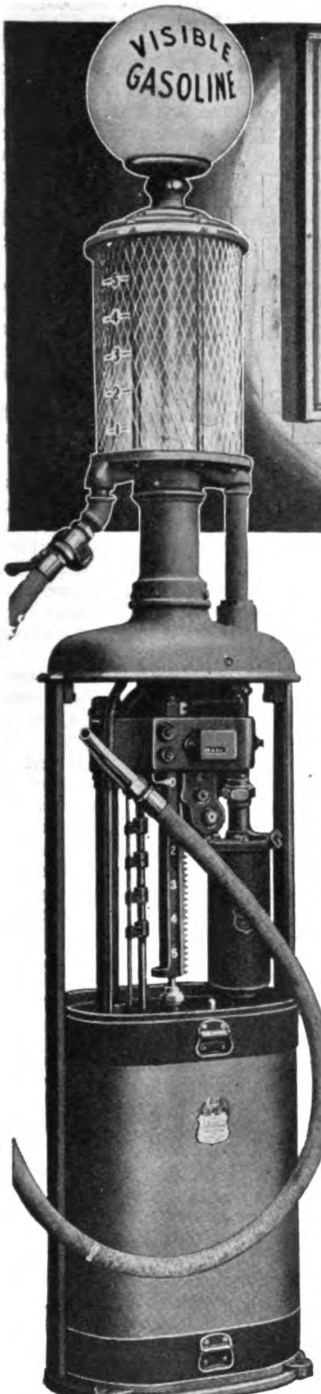


PUMP 204-V

Inspected and passed by the Underwriters' Laboratories and bears the Underwriter's Label.

The HANDWRITING ON THE WALL—

THERE are lots of "Doubting Thomases" driving automobiles—made so by unscrupulous dispensers of gasoline, whose shortcomings have figured prominently in the daily press.

Doubt and Suspicion, like Rumor, travel fast and far. Today the motorist demands to be "shown" the gasoline he buys—to KNOW that he GETS what he PAYS FOR—an assurance he does not question when served from an

American Visible Curb Pump

To get the maximum trade—to hold the confidence of its customers—the oil station today must sell VISIBLE GAS.

In the American Visible the gasoline is pumped into the protected glass container at top. The QUALITY and QUANTITY are both VISIBLE. The customer SEES what he buys—then the contents of the container are drained into the customer's tank—and THERE IS NO POSSIBLE WAY of diverting the gas back into the dealer's underground tank.

The American Visible Pump is **QUICK, SAFE and EFFICIENT.**

ONLY 25 SECONDS are required to fill and drain the container.

The pump is hand operated—avoiding frequent repairs and breakdowns.

The gasoline is filtered and every gallon pumped is registered by accurate meter—furnished WITHOUT EXTRA CHARGE.

Write us for information and prices—take heed of the handwriting on the wall—install an American Visible Pump and sell VISIBLE GAS—be prepared for the Spring trade.

AMERICAN VISIBLE CONTAINER

For other makes of pumps furnished complete and with full instructions for attaching.

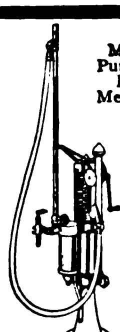
WRITE FOR PRICES AND INFORMATION

The American Oil Pump & Tank Co.

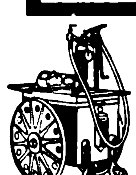
1143 Findlay St. **Cincinnati Ohio**

The "American" line includes a wide variety of gasoline outfits—both *visible* and *non-visible*, also lubricating oil, kerosene and paint oil equipment.

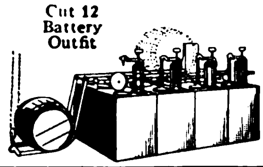
Model A Pump with Filter, Meter, Etc.



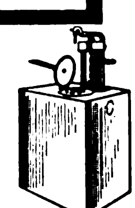
Cut 21 Portable Gasoline Outfit



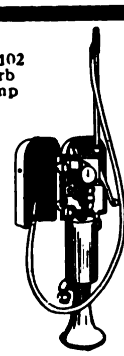
Cut 12 Battery Outfit



Cut 36 Lubricating Oil Outfit



Cut 102 Curb Pump



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Batrylife

As every motorist and repair man knows, the sulphuric acid electrolyte in the storage battery is usually the main cause of battery troubles, necessary though an electrolyte may be. To obviate all electrolyte troubles and to find a substitute for the conventional sulphuric acid bath, the Chicago Chemical Company of 20 E. Jackson Blvd. Chicago, Ill., have spent much time and money and claim, at last to have succeeded.

The next product, Batrylife, is designed to take the place of the liquid, sulphuric acid electrolyte. Batrylife is said to be practically immune to low temperatures, even though the battery is fully discharged. The actual freezing point, when fully discharged was found to be -31 degree F.

A series of exhaustive tests made upon storage batteries both with and without Batrylife were conducted by Mr. F. E. Edwards, chairman of the Technical Committee of the American Automobile Association. The test is a wonderful recommendation of this new product and may be obtained by any one interested from the Chicago Chemical Co. at the above address.

Tire Seal

To drive without fear of punctures is the motorist's ideal and if we are to believe what is being said by the National Tire Seal Company of 923 Washington Avenue South, Minneapolis, Minn., it is an easy matter to attain the punctureless ideal.

This company manufactures a semi-liquid compound which is forced into an automobile tire and when in the tire forms a thin, moist, pasty coating which adheres to the inside of the tube. Should the tube be punctured, this paste automatically seals the break before the air escapes.

Tire Seal is said to increase the life of tubes by keeping them moist inside and preventing under inflation arising from slow leaks. Tire Seal comes in cans which are provided with an attachment for an air pump at the top and a fitting to screw over the valve, at the bottom. It is forced directly from the can into the tire.

Addition to Mueller Electric Line

The Mueller Electric Company, 2135 Fairmount Rd., Cleveland, Ohio, has just added a new lead-coated wire handle which is known as the No. 110-A. This has an "offset" at the top of the handle which allows greater space between the handle and terminals of the battery. The drilling centers are 1⅝ inches which is standard with most manufacturers, while the grip has room for four fingers. The lead coating is put on by special process which gives a smooth finish that resists acid better than ordinary lead plating.

The Larson Adjustable Reamer

The Standard Tool & Supply Co., of Mason City, Iowa,, has recently placed on the market the Larson Adjustable bushing reamer. It is said that this device introduces a new principle in reaming pistons.

In operation, the reamer is contracted sufficiently so that it will pass through the bushings, the blade being long enough to reach through both bushings the reamer is then expanded gradually as the hole is being enlarged.

A. A. E. M. Announcement

The Association of Automotive Equipment Manufacturers, with headquarters at 3222 W. Washington Blvd., Chicago, Ill., has just held its annual election of officers, and re-elected Nathaniel Leverone as president for another year, and also re-elected W. E. Green as secretary.

This association is composed of a live, progressive "bunch" of non-competitive manufacturers of automobile accessories, automobile parts and equipment. Although a large percentage of its present members located in Chicago, Milwaukee, and vicinity, the scope of the organization is national in character, and quite a number of manufacturers throughout the United States have availed themselves of the opportunity and become members of this association.

Regular meetings are held on the first and third Friday evenings of each month, which keeps the organization up to the minute on all matters of importance. Information for members who reside at a distance is typewritten and forwarded to them. Manufacturers visiting Chicago are always welcome at these meetings.

R. & C. Lap Company Publication

The R. & C. Lap Company, Davenport, Iowa, have issued three new booklets covering their line of laps for toolroom and production work.

Two of the booklets are with special reference to the application of their process to lapping automobile cylinders. Copies of these booklets will be mailed to anyone on request.

Ahlberg Opens Ten New Branches

The Ahlberg Bearing Company, manufacturers and distributors of new high grade ball and roller bearings and manufacturers of Ahlberg Ground Bearings, announce this week the opening of ten additional branches, which makes a total of thirty-four branches owned and operated by this company.

Ahlberg Ground Bearings are turned out by the Company, and are not new bearings, but are remanufactured bearings. This company puts the bearings through a reclaiming process which has been developed by the Ahlberg Bearing Company over a period of twelve years. It is the practice of this company to carry a complete stock of Ahlberg Ground Bearings at each one of its thirty-four branches so that the users of automotive equipment will not be delayed in securing bearings they need.

It will be of interest to the trade to note that the new branches are located in the following cities:

Baltimore	Indianapolis
Buffalo	Newark
Columbus	Toledo
Dallas	Washington, D. C.
Duluth	Cleveland, O.

It is the intention of this company to establish a considerable number of branches in addition to those already in operation so that customers can avail themselves of its services with very little delay.

In line with the present time of direct distribution, the Ahlberg Bearing Company does not appoint any distributors or agencies of any kind, preferring to deal with the garagemen, dealer or fleetowner direct, feeling that this class of trade will get better service from the trained force of men who specialize in nothing but bearings. With this in mind all employees of the Ahlberg Sales Force are given a thorough schooling in ball bearing application before being allowed to leave the Chicago factory to be assigned to any branch.

The Autoquip Fuel Fractionator

The Autoquip Mfg. Co., Inc., of Rochester, N. Y., is bringing out a device which it claims will, on the average, produce a fuel saving of at least one third. At present the device is made only for Ford cars.

The device is called the Autoquip Fuel Fractioner and, as the name indicates, is designed to break up or "fractionate" the fuel. Engineers admit that fuel gives better results if it is very finely divided.

The Fractionator embodies in its design two features. First the fuel is broken up by mechanical means, rotating fans and second by means of heat.

The device consists of three units. Units one and two are alike and unit three is used simply to carry off surplus heat. The latter unit functions in a similar manner to the exhaust manifold.

To simplify the description we illustrate units one and two, unit one in cross section, unit two in full. Chamber 13, through the ports 14 connects with the exhaust gases. All of the exhaust gas passes into these two units bringing up the temperature of the units and heating the intake port passage 12. This heat is carried through to the fan 11.

Fan 11 is rotated by the inrushing, fresh gas and the latter is churned into small particles. The vaporization is further increased by the heat in the fan blades. The exhaust gases in the units are carried off both at the top, through the regular manifold and at the bottom through unit 3.

A priming device, number 8, is a part of the units. This device is connected with a source of current, either the magneto or the storage battery, and serves to vaporize the priming mixture when starting the engine.

Metal Specialties Adds Jorgensen Primer to Line

The Metal Specialties Manufacturing Co., 338-352 N. Kedzie Avenue, Chicago, Ill., has added the well-known Jorgensen Vapor Primer to their line of Presto Products. This vapor primer was formerly manufactured and marketed by the Jorgensen Mfg. Co., Waupaca, Wis.

It is said that prominent engineers everywhere have acknowledged that the Jorgensen Vapor Primer actually vaporizes the gasoline, insuring quick, sure starting of motor in the coldest weather. It has the noted distinction of having been adopted, and is now being used as standard equipment on several well-known makes of automobiles, trucks, tractors and motor boats, also by the U. S. Government in the Airplane Service. It is easily and quickly installed, as all fittings necessary are furnished complete with each primer.

The line of Presto Products is one of the best known lines of automobile accessories on the market to-day, and the management of the Metal Specialties Mfg. Co. is to be commended on its success in adding to its popular line another high-grade, quality article.

A. O. Smith Literature

A. O. Smith Corporation, Milwaukee, has published a small folder (Publication No. 101) describing and illustrating the new Smithsteel Running Boards for Ford Cars. The title of the folder is "Adding Class and Resale Value to your Car." Illustrations of both the linoleum and aluminum covered boards are included as well as prices. Readers who are interested should write for a copy of this folder.

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"Ace" Ignition Batteries

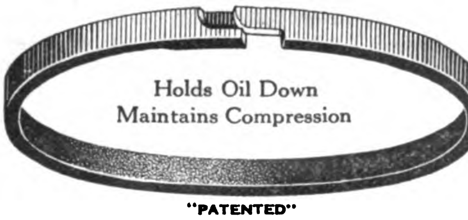
Ace Ignition Dry Cells are designed primarily for ignition or other heavy duty service and are guaranteed to give entire satisfaction.

The Ace Hot Spark is a moisture proof unit battery made up of carefully selected Ace Cells; a compact, convenient battery, especially designed for Gas Engines, Tractors, Motor Boats, Ford Starting, Garage Lighting, Vacation Lighting and other similar purposes.

Let us send you complete data

THE CARBON PRODUCTS COMPANY
MANUFACTURERS OF
Dry Batteries and Carbon Products
LANCASTER, OHIO

PEERLESS



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"THE RING IN THE CAR AHEAD"

PISTON RINGS

STANDARD OF AMERICA

FOR *SEVEN YEARS* THE STANDARD MECHANICALLY CORRECT RING FOR REPLACEMENT SALES.

Liberal Selling Agreements open for Responsible, Exclusive Distributors.

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H. K. Burgess Co., 2209 4th Ave., So., Minneapolis, Minn.
Hellyer Steel Parts Co., 909 So. Grand Ave., Los Angeles, Cal.
Motor Equipment Co., 72 S. Broadway, Portland, Ore.

PEERLESS RING SALES CORP.

3846-48-50 N. Clark St.,

CHICAGO.

A perfectly made piston ring, equally efficient for compression and oil troubles, with an oil-sealing, oil-controlling channel, the only one with outlets to release excess oil, preventing clogging. The "self-seating" surface fits it. 3 rings are installed on each Piston.

Fit Themselves to the Cylinder

All cylinders, after a few months of service, become slightly out-of-round, due to constant expansion under intense heat and contraction when cooling. All Repair Men are familiar with this condition, which is found in most motors, requiring new piston rings.

Unless the new rings fit these out-of-round spots, there will be an escapage of compression. No piston ring can be manufactured which will immediately fit such cylinders. To secure a perfect fit the rings must *wear in* to fit the imperfect cylinders. No piston ring with a smooth, hard surface can do so, because when it comes in contact with the highly glazed cylinder walls, with a film of oil between, there is no "give." Such rings often take months of running before the car has even fairly good compression. But the Tell Tale ring gives perfect compression from the start. It has a "serrated" surface consisting of a series of finely tooled spirals 2-1000 inch deep, cut on the wearing surface. These allow rings to fit themselves to the exact shape of each cylinder in a few hours of running.

Stop Oil Pumping

By means of a special, patented oil channel with outlets the Tell Tale ring absolutely stops "oil pumping." It is the only channel with outlets to release the oil on each up-stroke; it cannot carbonize or clog.

Guaranteed to give complete satisfaction, on a "money back" basis.

Write for Descriptive Folder and Discounts

Complete descriptive folder, 'The Balance of Power," will gladly be sent on request. Address factory or nearest Distributor listed below Good discount to Dealers and Repair Shops. We also have an especially attractive Service Station proposition for responsible Dealers who will carry a small assorted stock. Ask for details.

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Acme Piston Ring Co......2017 S.Michigan Blvd., Chicago, Ill,
The Standard Metal Goods Co...2080 E.30th St., Cleveland, O.
The Motor Industry Specialty Co..1807 McGee St., Kansas City
The Miller-Wiegand Co.........217 N.Main St., Dayton, Ohio

Canadian Distributors........The Standard Metal Goods Co.
170 King St., West, Toronto, Ontario, Canada

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PISTON RINGS

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PATENTS PROCURED AND TRADEMARKS REGISTERED—Eighteen years' experience. Instructions and Terms on request. Robb, Robb and Hill, Attorneys at Law, 888 McLachlen Bldg., Washington, D. C. 1340 Hanna Bldg., Cleveland, Ohio.

PATENTS SECURED—C. L. Parker, Patent Attorney, McGill Building, Washington, D. C. Inventor's Handbook upon request.

Opportunities

"Be the first and only dealer in your town to handle the only pneumatic practical and proven Puncture Sealing Inner Tube on the market. Fully guaranteed. Our proposition to dealers and agents assures steady increasing business and remarkable returns. Dept. G, Wenstone Rubber Products Co., 3025 Indiana Ave., Chicago, Ill."

Charging

REMAGNETIZERS for all magnetos Fords charged while engine is in car. Thousands in use since 1915. Endorsed by trade schools, U. S. Government, garages everywhere. Generates 225 pounds magnetic pull from six volt battery. Dry cells operates. Guaranteed List price $8.50. Liberal trade discount. Distributors wanted. Benner Manufacturing Co., Webb City. Mo

For Sale

FOR SALE—Garage, Storage (40) car repair shop, car agency. New building, fireproof and steam heat. Price $31,500.00. Write C. LYNN, 255 West 2nd Street, Fulton, N. Y.

Auto Mailing Lists

DON'T BE MISLED. But buy Massachusetts Motor Vehicle Registrations direct from the original publishers. Whole State or by Counties, Cities and Towns. 1921 lists. Auto List Publishing Co., 138 Pearl St., Boston, Mass.

Instruction

AUTOMOBILE INSTRUCTION—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice of four or eight weeks, day or evening. Provision made for out of town men. 322 West 57th St., New York City.

Wanted

WANTED—Men with Ford cars to sell Stokes Carburetors. Exclusive territory given. Write for particulars. Stokes Carburetor Co., Inc., Good Ground, Long Island, N. Y.

RADIATOR REPAIR MEN send for free information booklet on the construction and repair of auto radiators by E. E. Zideck, Radiator Specialist. This offer is for limited time only. Address A. T. Breer, 326 West Main St., Ottumwa, Iowa.

Agents Wanted

Make: $80.00 to $100.00 weekly selling "Rite-Weav" transmission lining for—Fords to dealers and repairmen. Our new method of selling makes sales easy to get. Wire or write us at once, territory going fast. Libby Manufacturing Company, 111-121 Watchung Avenue, Plainfield N. J.

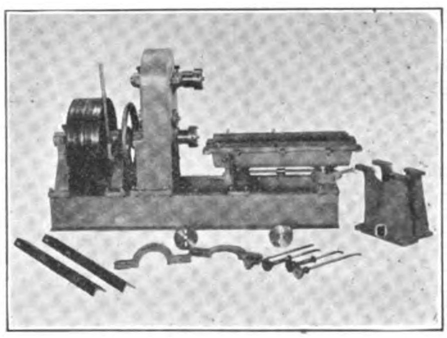
C-O Universal Burning-in Machine.

One of the most important announcements for many months to the automotive trade, jobbers and garage repair men, is word of the development of a Universal Burning-In And Running-In Machine, designed and built by the Canedy-Otto Mfg. Co., of Chicago Heights, Ill. This company has pioneered many note-worthy improvements in Forges, Blowers, Drills, Motor Stands and other repair equipment for shop work and the trade will be quick to recognize the unusual importance of this announcement of a Universal Burning—In Machine, which will handle any motor regardless of type or make.

The manufacturer claims for this machine, that it will positively burn-in and run-in the bearings of any type motor. Only one attachment is required and this is needed only for burning-in, valve in the head V-type motors. It is quickly attached and comes as part of the regular equipment. This attachment will also handle motors which do not have detachable heads, an operation which has puzzled the repair man for many years.

The table is raised and lowered by a single control. This table is grooved like all high class machine tool tables and the motor clamps can be adjusted to size of motor. The table also serves as a sump or crank case for the motor, so that the crank-shaft splashes in fresh oil, in every way similar to the actual performance of the motor in operation.

The clutch is an extra heavy toggle



Universal Burning-in Machine.

type, driving through a silent chain, which is so noiseless, that the operator can test the timeing of the motor or detect noises after the bearings have been run-in.

The machine requires a floor space of only 90 inches over all, with an actual base measurement of 79 inches. 20 H. P. is sufficient to run the machine to capacity, under the most severe conditions, with the largest of motors. A single lever controls the raising and lowering of the table with a tension lock. All parts are highly machined to the usual standard of accuracy, maintained in all Canedy-Otto equipment.

Manufactured as it is by the largest builders of Automotive Equipment in the world, its dependability is assured before being offered to the trade. Detailed illustrated bulletin will be gladly sent to anyone who is interested. Samples are being delivered to Canedy-Otto jobbers in various parts of the country. Inquire direct of the manufacturer for literature.

McKone Tire Announces Officers

The McKone Tire & Rubber Company recently organized with factories at 1943 McCormick Bldg., Millersburg, Ohio and General Offices at Chicago, manufacturing McKone Fabric and Cord Casings and Inner tubes: announces the following officers:

A. L. Gustin, President, Chicago;

C. W. McKone, Vice-President and in charge of production, Millersburg;

L. C. Conley, Secretary-Treasurer;

O. S. Tweedy, Manager of Sales, Chicago.

The organization of the McKone Company is particularly interesting from the fact that the output over a period of years is largely sold in advance, and from the fact that the distributors are not only interested in the disposal of the output, but are also substantial stockholders in the parent company.

Among the large distributors are: The Conley-Hussey Company, Chicago; Gustin-Bacon Mfg. Co., Kansas City, Mo.; E. J. Methudy, St. Louis, Mo., and several others of equal prominence.

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PRESSURE PROOF PISTON RINGS

when spring overhauling is under way. Gas and oil are kept where they belong—there's no oil-pumping, dilution of lubricant. or accumulation of carbon. Add to your list of satisfied customers by using and recommending Pressure Proof Rings.

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No. 10
"SCHWARZE"

Motor Driven Horn with Special Ford Bracket

The popular "SCHWARZE" No. 10 (supplied with a variety of Brackets) meets the demand at a popular price and pays a fine profit. *Get our Service proposition* on "SCHWARZE" and "SELCO" Motor Driven and Vibrator Horns.

A complete line of extreme values—your jobber has them—WRITE TODAY.

SCHWARZE ELECTRIC CO., Adrian, Mich., U. S. A.

THE SIGN

WE MAKE NEW ONES ALSO
AB CO
CHICAGO ILL.

OF SERVICE

AHLBERG SERVICE

and

Ahlberg Ground Bearings

are the solution of your bearing troubles.

Ahlberg Ground Bearings

reduce upkeep costs—and

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on new bearings gives you what you want with a minimum of lost time.

Ahlberg Bearing Company

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(All Universal Motors–Licensed under Burke Patent)

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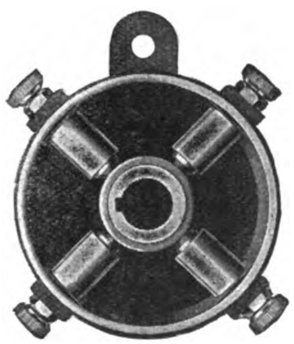
IMPROVED BENCH GRINDER
Also Made in Floor Type For Both A. C. and D. C. All Sizes



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TIMER FOR FORD CARS

The timer with the written guarantee that insures the buyer perfect timer service for two years and at 50 cents per year thereafter. Write our sales dept. today for full details.

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Assembled Patented—1911 Apart

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IDEAL Clamp Mfg. Co., Inc., 198-202 Bradford St. **Brooklyn, N. Y.**

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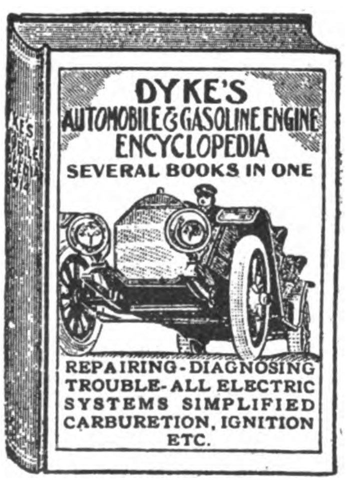
DYKE'S AUTO ENCYCLOPEDIA

12th Edition

is a book of 956 pages—several books in one. It contains 3362 illustrations and 6200 lines of index



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Price, Cloth Bound

$6.46 prepaid

It was used by our Government and sanctioned for use in Schools of Military Aeronautics in England during the war.

It Will Teach You How to Become:

(1) An Automobile Repairman.
(2) Engine Expert; Testing and Overhauling.
(3) Electric Starter, Generator and Electric Wiring "Trouble Shooter."
(4) Ignition Expert.
(5) Tire Repair Expert.
(6) Storage Battery Expert.
(7) Carburetor Expert.
(8) Tractor Expert.
(9) Truck Expert.
(10) Automobile, Tractor and Truck Operator.

Some of the Subjects Added to This Edition:

(1) **Voltmeter and ammeter tests;** how to make all electric tests and how the meters are constructed and how used, including Ford tests.
(2) **How to test magnetos** and repair same, assembly and disassembly.
(3) **How to construct an electric testing outfit,** for starters, generators, magnetoes, coils, horns, etc., and how to repair same.
(4) **How to make "cadmium tests" for storage batteries** and how to disassemble and repair batteries.
(5) **How to repair tires, how to vulcanize, and proper equipment for starting into the tire repair business.** All about "fabric" and "cord" tire construction and vulcanizing; difference between "sectional" and "wrapped tread" repairs, etc.
(6) **How to measure clearance of pistons, rings,** etc., and how to disassemble and assemble engines and make repairs.
(7) **Specifications and prices of 1919 cars.**
(8) **Ford electric starting, generating** and lighting systems and a lot more, too numerous to mention.

Remember, all this new matter is in addition to the great mass of information as previously contained in this book, and everyone who purchased former editions of this book said it could not be improved.

In addition to Instructions on every detail of the Automobile, from Repairing to Equipping a Shop and Starting into the Business—there are also Instructions—fully illustrated—on TRUCKS, TRACTORS, MOTORCYCLES, AIRPLANES and LIBERTY ENGINE.

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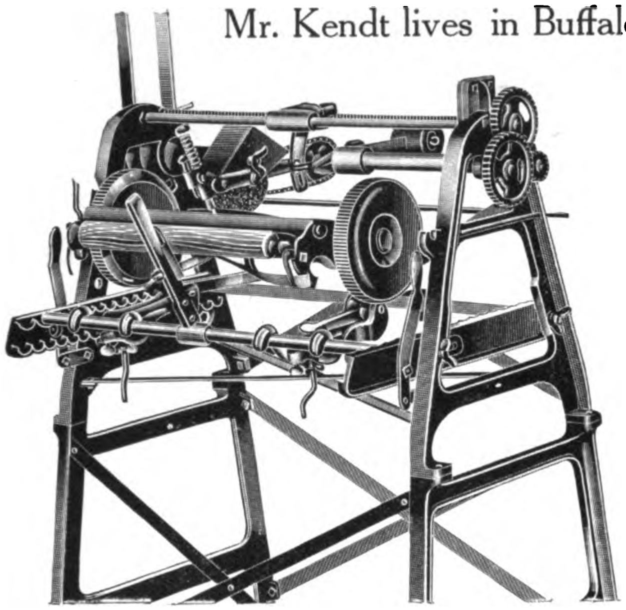
I Made $1412.63 on the Side

During the Grass Season with your IDEAL Lawnmower Grinder writes W. F. Kendt.



Mr. Kendt lives in Buffalo, and sharpened 790 lawnmowers. Says best investment ever made.

Read What Zeno Says

Zeno Brandon lives at Middletown, Ohio and writes;

"I have worked 55 days and made $820.70. Have made as high as $38.70 in one day."

Write for Catalogue

And little booklet, "LET GEORGE SAY IT." It tells the stories of profit as the boys tell it. Mr. Brown bought early, made $1400 by fall, and built a new shop with the money. Write today.

The Fate-Root-Heath Co.
PLYMOUTH OHIO

Sterling Twin Gear Jacks

Our 1922 Models will lift any touring car without crawling under. Long folding handles.

Send for catalog of 15 sizes. Prices $1.50 up.

REPUBLIC AUTO PARTS CO.
85 10th Street LONG ISLAND CITY, N. Y.

CYLINDER GRINDING

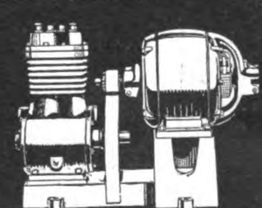
Pistons Piston Rings Piston Pins

Now located in our new modern plant
The Home of the Bunite Piston.

Best Equipment Skilled Mechanics
Quick Service

BUTLER MANUFACTURING CO.
3234 West Washington St., Indianapolis, Ind.

BRUNNER



AIR COMPRESSORS

Serve 60% of the Car Dealers and Owners of North America.

BRUNNER MFG. CO. UTICA, N.Y.
Sales Offices: Utica, N.Y., Cincinnati, O., Kansas City, Mo., San Francisco, Calif.

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SUPER-SIX
Expansion Reamer

Quick cutting, non-chattering. Won't scratch or gouge. Oversize expansion insures economy. A money saver for everyday use. Indispensable in emergency.

Made in 12 sizes, A to L. Will ream any size hole from 15/32 to 1 25/32 inches. Write for descriptive circular.

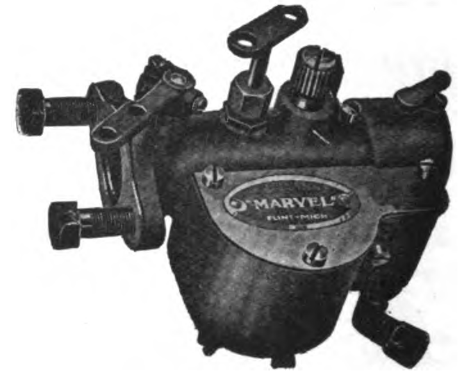
IMPROVED SUPER LINE EXPANSION SIX REAMER

Try Your Jobber First

CUTTER & WOOD SUPPLY CO.
274 Friend Street **BOSTON, MASS.**

115-49

FORD SPECIAL



MODEL "N" $10.00 f. o. b. Factory

Review in your mind the important part carburetion plays in your motoring experience.

Isn't it more satisfying to have a carbureter that can be depended on to function under all conditions?

Marvel performance, economy and durability is an established fact, backed by the judgment of some of the largest automobile manufacturers.

MARVEL CARBURETER CO.
FLINT, MICH.

For Every Make Of Car

PERFECTION PEDAL PADS

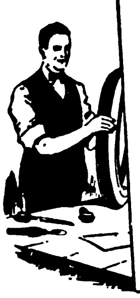
Clamp 'em on right away—in less than a minute. No bolts—no drilling of holes in pedal—no bother of any kind.

By sheer force of superior merit Perfection Pedal Pads have won their way as the standard of design and quality for all cars. Their constant dependability is something you have never encountered before. If you believe in safe driving write to us for all the facts including literature.

Write and ask us about our new Ford Extension Pedals

Patented
Dec. 21, 1915

AUTO PEDAL PAD CO., INC.
318 West 52nd Street New York City

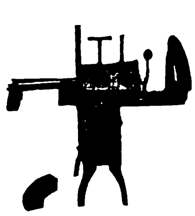


The Best and Most Economical Tire Repair Equipment

FOR ANY TIRE REPAIR SHOP

We make a complete line of Vulcanizing Equipment. Also a full line of Tools, etc.
Write for Descriptive Catalog and prices

The Akron Rubber Mold & Machine Co.
941 Switzer Ave. AKRON, O.



AKRON-RUBBERMOLD
TIRE REPAIR EQUIPMENT

CRANE PULLER

THE ORIGINAL
PULLING TOOL

QUICKLY, SAFELY AND EASILY REMOVES AUTOMOBILE AND TRUCK WHEELS, FLYWHEELS, GEARS, COUPLINGS AND CAMS, STRAIGHTENS BENT SHAFTING.

BUILT FOR SERVICE

Write for latest catalog. Order from your jobber.

CRANE PULLER CO.
54 Lake St. Arlington, Mass.

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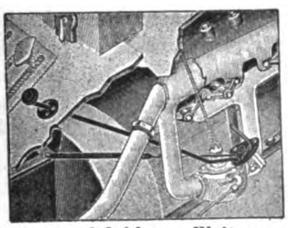
National Rubber Tirefiller

A genuine all rubber Tirefiller that is a success, because we have been making and selling it for more than eight years, selling more than 300,000 sets of it during that time. it is an all rubber Filler, constructed and built for wear-resisting, shock-absorbing, comfortable riding qualities. Besides this, it will double the mileage of any tire over that you get with the use of the inner-tube and air. The price is right. Even better than pre-war prices. We will be glad to give you further information, prices and sample.

NATIONAL RUBBER FILLER CO.,
208 Main Street,
MIDLOTHIAN, TEXAS.

The EWALD
FOOT ACCELERATOR for FORDS



Allows the driver to control the speed of his car entirely with his foot, leaving his hands free to operate the wheel, brakes and horn.

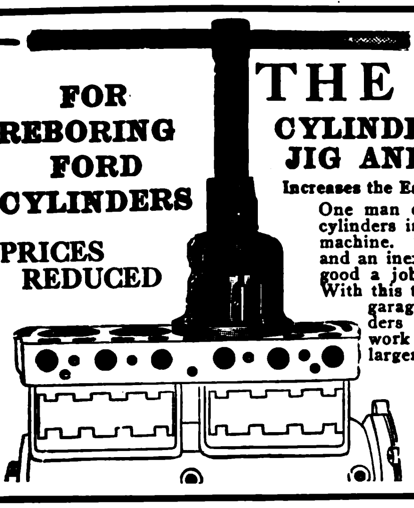
A convenience in the country
A Necessity in the city.
Every Ford Owner a Buyer:

Dealers and Jobbers—Write our sales dept. today for full details

Manufacturers
ROMORT MFG., CO.
OAKFIELD, WIS.

Price 75c

Sales Dept.
THE ZINKE CO.
1321 Michigan Ave
Chicago, Illinois.



FOR REBORING FORD CYLINDERS

PRICES REDUCED

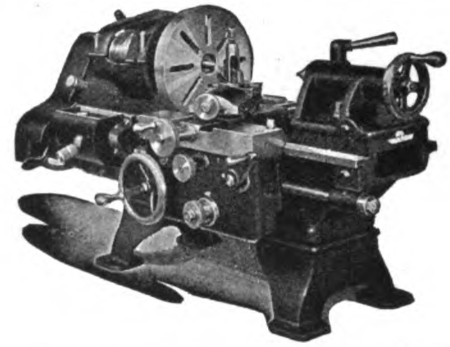
THE DAVIS
CYLINDER REBORING JIG AND REAMER

Increases the Earning Power of Your Shop

One man can rebore a set of four cylinders in sixty minutes with this machine. The tool centers itself, and an inexperienced man can do as good a job as an expert machinist. With this tool the smaller shops and garages can rebore cylinders and guarantee the work to be as good as the larger dealers with their expensive machinery. Makes the motor better than new. Write for price and full particulars.

he Hinckley Machine Works
Hinckley, Ill.

Monarch Junior Lathes
"The Biggest Little Lathes Built"



This Monarch Junior Engine Lathe—9" swing, 2½ foot bed—fully equipped bed length—and guaranteed to do any small work that any lathe will do.

Price $225.00
WITH BENCH LEGS

A real engine lathe, of small size, compactness, and low cost—guaranteed to do all small work with 1/1000 of inch accuracy.

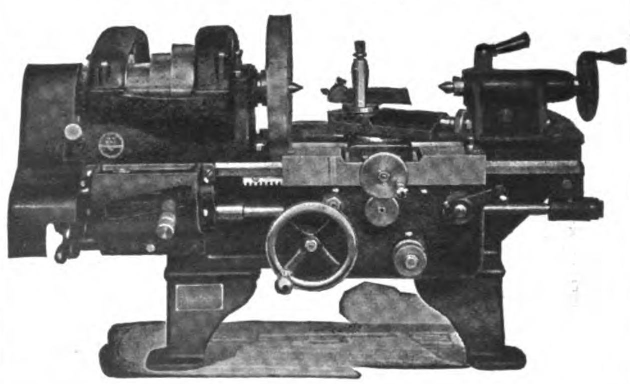
The ideal equipment for small repair shops and garages—also the most economical for doing small work in the larger shops. Built with the same care and precision that made Monarch Engine Lathes the world's Standard of quality and efficiency.

Monarch Junior Lathes are also built with 11 inch swing priced slightly higher than the 9 inch size. Either size may be had with bench or floor legs. (Floor legs $5.00 extra.)

Full information and a descriptive catalog of Monarch Junior Lathes will be sent on request. A special garage catalog gives full information of larger Monarch Lathes from 10" to 24" swing, especially adaptable to garage and service station work.

The Monarch Machine Tool Co.
202 Oak Street Sidney, O.

Monarch Junior 9" with Bench Legs



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"SUPER-UNIQUE" Set

LANE'S UNIQUE TOOLS

The Super-Unique Ratchet Wrench Set is primarily intended for heavy duty in the shop. The set consists of a 9" drop forged reversible Ratchet Wrench, 8" Steel Extension Bar with fixed Socket and 15 Broached Hardened Steel Sockets in size by 16ths from 7-16" to 1¼" inclusive with intermediate sizes of 19-32 and 31-32.

Lane's Unique Tools are guaranteed against breakage.

Sold by Jobbers and Dealers everywhere.

WILL B. LANE UNIQUE TOOL CO.
170 W. Randolph St. Chicago, Ill.

VELLUMOID

SHEET PACKING

MANUFACTURED FOR ONE PURPOSE

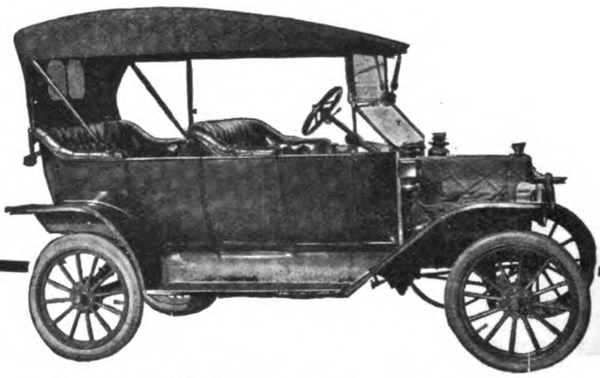
TO MAKE TIGHT OIL, GASOLINE and WATER CONNECTIONS

TOUGH
COMPRESSIBLE
DURABLE

Gaskets easily fashioned—no shellac required. Not only makes tight joints but the joints stay tight after hard usage. With service the aim of all repair men, is it advisable to use poor gaskets that will soon leak, thereby risking one's reputation on an otherwise well done job? The difference in price between a good and poor gasket is infinitesimal. Let us help you in this matter! If your jobber does not handle VELLUMOID write to us.

Samples Gladly Furnished

FIBRE FINISHING CO.
73 TREMONT ST.
BOSTON MASS.



A Free Book for Auto Repair Men

The Auto Repairers' Guide & Price Maker is issued in the interest of automobile repairers, dealers and garage men—it's free to the trade and sent to them only.

Think of it, 320 pages of bargains—about 2500 illustrations—a complete auto repairers' guide and price maker—quotes lowest wholesale prices on first quality automobile supplies, auto repairers' tools, tool kits, spark plugs, horns, lamps, pumps, springs, forgings, batteries, coils, switches, auto tops, Ford Specialties, and in fact everything used on an auto.

Write for your copy today, sending business card, letterhead or some other evidence that you are in the trade.

CRAY BROTHERS
Jobbers and Manufacturers of Auto Accessories
1119-1123 W. 11th St., Cleveland, Ohio

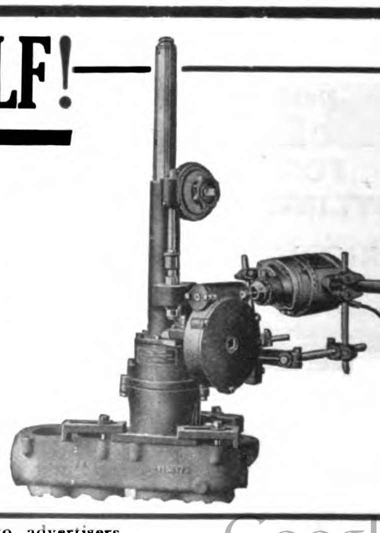
MAKE THE PROFIT FOR YOURSELF!—

Reboring done right—right in your shop

Your customers come to you because of their confidence in your doing the job right. So that it is not fair to them—fair to yourself—to have to be responsible for cylinder reboring by another.
Equip with "THE YORK" and do the job right, right in your shop; Get all the profits, not a meagre 10%.
Write for details of "THE YORK." Hand or electrically driven, bores any motor block from 2 1/2" to 5 1/16"—Write for catalogue.

"The YORK" Boring Machine

The Winterknight Equipment Co., Philadelphia, Pa.



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Excelsior Oil Economizer for Ford Cars and Trucks

Type A for Ford Cars 1914 to 1918
Type B for Ford Cars 1919 to 1922

Prevents oil from spraying over the motor, fan belt, wires and the inside of the hood. Makes the replenishment of oil an easy matter. Quickly installed; when fastened, becomes an integral part of the engine; cannot rattle or come loose.

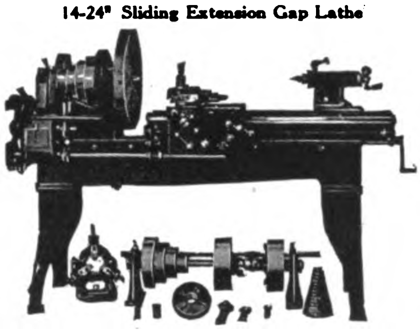
This is one of the best selling Ford Accessories ever placed on the market. Every Ford owner needs one and buys on sight wherever it is shown.

Retail Prices, 85 cents; $1.00 west of Mississippi and Canada

Excelsior Auto Parts and Supply Co.
Bridgeport, Conn.

The Universal Motor Service Lathe

14-24" Sliding Extension Gap Lathe



Just the thing for Garages and Motor Repair Shops:

A high-grade lathe with a wide range of usefulness at a very reasonable price:

The Universal is strong, durable and accurate. It will cut right and left-hand threads, and millimeter threads. It is capable of perfect work on all kinds of milling jobs, taper work and cylinder reboring.

No motor repair shop can afford to be without this high-grade, reasonable priced machine. Drop us a line, and ask for new bulletin and latest prices—it will start you on the road to bigger profits.

BARNES DRILL COMPANY
818 CHESTNUT ST. ROCKFORD, ILLINOIS

A Reel Short Story

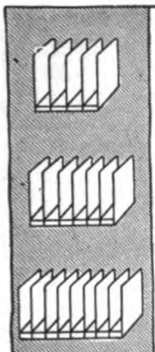
The appeal of the reel is this—it is heavily built, accessible, the 25 feet of enclosed cord cannot jump off the spool and it is fully warranted to stand up and deliver.

Handee-Lite

Clark E-x-t-e-n-s-i-o-n Reel

For garages, stockrooms, machine shops, factories, gas and battery stations, basements, etc. PRICE SURPRISINGLY LOW. Standard porcelain keyless socket, or brass key socket on order.

JAMES FITT MACHINE CO., Inc.
116 Congress Ave., Rochester, N. Y.



Kleradesk

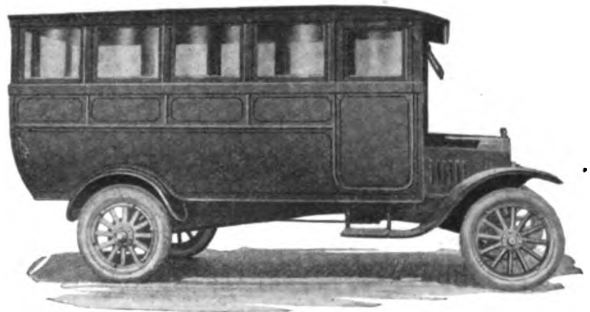
Automatically sorts and routes mail, memos, orders, etc., for all to whom mail is distributed. It holds reference papers out of way but immediately at hand when needed.

A Steel Sectional Device

Add new compartments as required. Sections $1.20 each. Five-compartment Kleradesk illustrated below only $7.20. Write for free, instructive, illustrated folder, *"How to Get Greater Desk Efficiency."*

Ross-Gould Co. (4)
109 N. 10th—St. Louis

New York
Philadelphia
Chicago
Cleveland



Manufacturers of

Bus and School Bodies

For any type

CHASSIS

Write us for Catalog and prices

McKay Carriage Co.
Grove City, Pa.

HY-POWER TIMERS

Sliding Shoe Contact

Adopted by the Great Electrical Engineers as Correct Principle of Electrical Contact

FOR SALE BY LEADING JOBBERS

Benford Auto Products, Inc.
Mt. Vernon, N. Y.

RED-I-FIT FOOT FEED

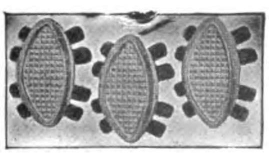
ACCELERATORS WORK ALL THE TIME

Only two parts, direct drive from pedal to carburetor pull rod. Does not attach to the floor boards or interfere with their removal, replaces carburetor pull rod by merely changing two cotter pins. Quick and easy to install. GIVES THAT EASY AND POSITIVE MOTION

Fits all Ford Cars

Price $1.50, West of Rockies $1.75, Canada $2.35

HEATON-AULT, 6249 Greenwood Ave., CHICAGO



"RICO"

Ford Pedal Covers

one set will outwear three sets of any other kind.

Price per set of 3—75c

Rich Mfg. Co.
69-71 Greene St., N. Y.

Syra-Cord Plans Meet With Favor

There seems to be little doubt that the sales plan announced by the Syracuse Rubber Co., Inc., late last summer has met with almost universal favor. Tire merchants in all parts of the country have acclaimed it as pointing the way to a new era in tire merchandising while manufacturers and the trade in general have been looking on with interest to see how the plan would work out. That the plan is thoroughly workable is proved by the fact that this company has enjoyed, during September and October, the largest business in its existence.

This plan which has created so much interest is built largely on the proposition that the tire distributor is the most important link in the chain of distribution; that he should be given a protected territory large enough to give him a very profitable business but not so large that he cannot thoroughly cover it; that he should be given a sufficient margin of profit to enable him to compete profitably and to give his dealers an attractive proposition; that he should control his own territory, securing his own dealers and handling his own adjustments; and that he should receive sufficient cooperation in the sort of advertising and sales helps that will tend to establish his reputation as an honest and capable tire merchant whose advice motorists can accept with confidence. These are just the high lights of the plan but it all follows along the same line, and issues a call for a higher type of tire merchandizing.

The Syracuse Rubber Co., Inc., manufacturing and selling Syra-Cord tires and tubes, has been in operation for about two years and has already built up an enviable reputation for making a product of high quality. The Syra-Cord line consists of all sizes of cord passenger and truck pneumatics all sizes of red and gray tubes, fabric casings in 30 x 3 and 30 x 3½ with a special 5 ply 30 x 3½ fabric, and cord special grey tubes of extra heavy construction in 30 x 3½ and 31 x 4, making up a line that will satisfy practically all demands.

The C. M. B. Wrench Sets

For those autoists who do their own repairing and for those repair men who realize the value of a socket wrench set, we commend the socket wrenches of the C. M. B. Wrench Co. of Garwood, N. Y. These wrenches are put up in sets of various sizes to fit both the automobile nuts and the pocketbook.

The sets consist of socket wrenches, ratchet handles and universal joints as well as extension arms to reach the most inaccessible nuts.

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Index to Advertisers

Classified Buyers' Guide

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Electric Trouble Shooter
AMBU
Detects and locates, quickly and accurately, trouble in any American made starting and lighting system used as standard on any American made car.
AMERICAN BUREAU OF ENGINEERING, Inc.
2632 Prairie Ave. Chicago, Ill.

ZIP Friction Paste
for fitting-in bearings
Write for Sample Tube Sent FREE
ZIP MFG. CO. Denver, Colo.
ZIP ABRASIVE CO. Cleveland, Ohio

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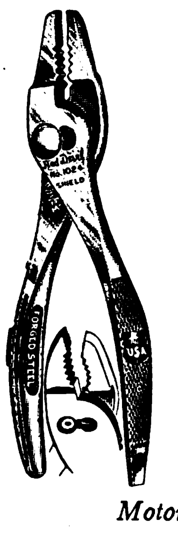
CONTENTS

TRADE MARK Red Devil Tools

"Red Devil" Pliers



—Handy to use
—Keep them at hand

FOR any work on a motor, you will find a pair of "Red Devil" Pliers the most useful tool you can possess. Made of drop forged steel. You can use them in close places on a stubborn nut or you can make the most delicate adjustment.

Ask your dealer to show you "Red Devil" Pliers No. 1024—the workmanlike tool for the workmanlike job. If not in stock, send $1.10 for a 6½ in. tool.

Motorists' Tool Booklet Free

Smith & Hemenway Co., Inc.
Manufacturers of "Red Devil" Tools
84 Coit Street Irvington, N. J.
"Red Devil" Corrugated Lock Washers Stop That Rattle!

NEW ERA
De Luxe all metal
VISOR

At Last!

Car Owners have waited for this Vizor. Right in every way. Has patented rain gutter and side awnings. Adjustable to any desired height. Dull Green underside rests driver's eyes. Absolute protection from sun, snow and headlight glares. Adds a touch of completeness and style to car. Price reasonable. Steel $7.50, aluminum $10.00. Sells at sight. Stock it now.

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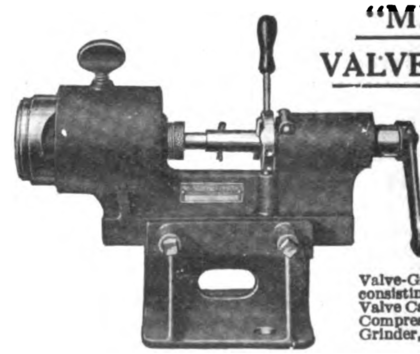
New Era Spring & Specialty Co.
58 Cottage Grove Ave., Grand Rapids, Mich.



"MINUTE"
VALVE GRINDER
For Buick
Price with stand
$10.00

Valve-Grinding Set, for Buick, consisting of Rocker Arm Lever, Valve Cage Remover, Valve Spring Compressor and "Minute" Valve Grinder, Price $15.00

Write for Catalog of Newton Indispensable Tools and Equipment for Service Stations, Garages and Owners.
THE NEWTON MFG. Co. Plainville, Conn., U. S. A.

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PRECISION PRODUCTS

POPULAR-PERMANENT-PROFITABLE

PRECISION REAR TRAFFIC SIGNAL

Tested and Approved by the Underwriters Laboratories

No Stop Light or Rear Traffic Signal can be more dependable than is its switch, which, if weak or cheaply constructed, will soon wear out, with the result that the car owner is in constant danger of rear end collision and disaster. Subjected to the severest tests of the Underwriters Laboratories, as well as having withstood over 1,000,000 operations submerged in water, carrying current for a 60-Watt lamp without showing the least sign of wear or deterioration, The Precision Switch has proven its absolute dependability.

The body of the lamp is a one-piece drawn shell, dirt and water-proof.

Gives a brilliant light, readable at great distance both day and night.

Retail Price $4.50
West of Rocky Mountains $4.75

PRECISION HED-LITE GLARE DEFLECTOR

Made of Metal — Not a Lens

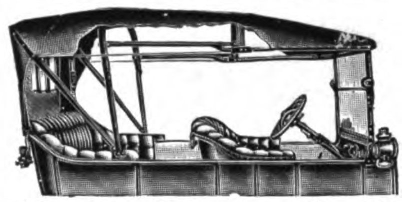
Hed-Lite Glare Deflectors in no way dim the light, nor reduce the amount of light necessary for safe driving, but rather increase it by deflecting all the upward rays down on the road where they are needed most.

They are legal everywhere, having already passed the rigid tests of many states.

Easily and quickly installed. Made of white enamel steel in three sizes for all cars.

No. 1 for 8-8¾ in. lens
No. 2 for 8⅞-9⅜ in. lens
No. 3 for 9½-10½ in. lens
Price per Pair, either size, $2.50

PRECISION TOP CONVERTER



FOR FORD CARS

A Precision Top Converter will add 100% to the appearance and convenience of any Ford Car. It entirely eliminates the unsightly and obstructing front bows and tension straps giving an unrestricted passage through the front door and clear vision while driving, as well as rejuvenating and modernizing the appearance of the entire car.

Price Complete for Touring Cars or Roadsters, $7.50

PRECISION AUTOMATIC OILER

Replaces the inefficient grease cups on king pins, steering post and other parts using a vertical cup. Insures perfect lubrication at all times by means of wick feed. Especially designed to keep out dust and dirt. Will not open from jar of car.

Write for Prices

Write Us Today for Full Details

PRECISION METAL WORKERS

3104-12 Carroll Avenue — **Chicago, Illinois.**

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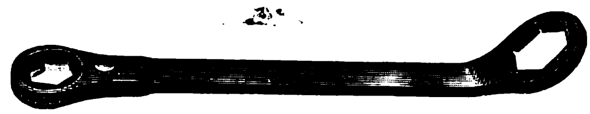
Fawsco Steel Wrenches

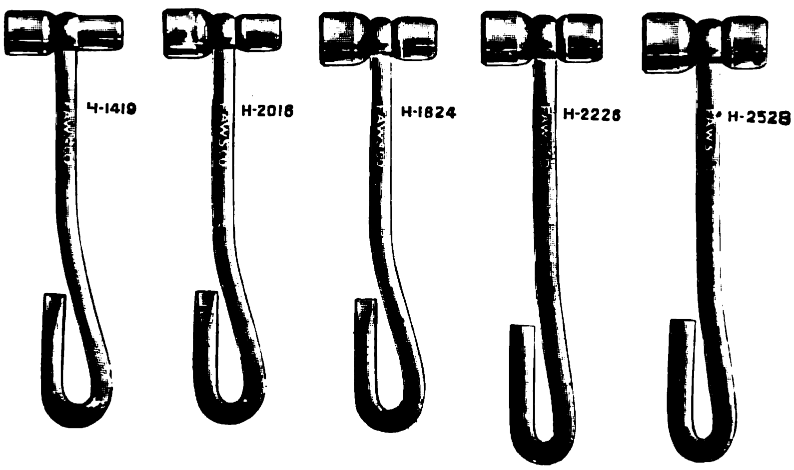
Measure Up To Three Standards

NEED———VALUE———SERVICE

No. H-2020—Most used of all for cylinder head bolts on Fords,etc. Each $0.80.



No. 2230—A combination, ratchet and plug wrench for Fords. The pedal band's friend. Each $1.25.

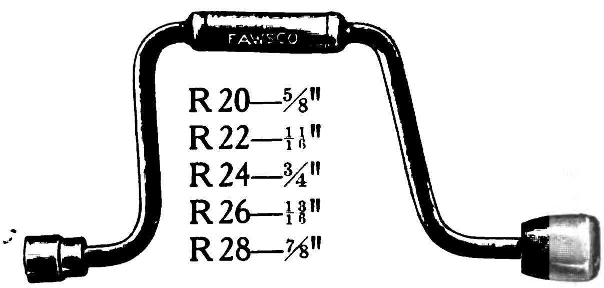


The Hammer-Head Pattern

is best for surface work and has ten openings.

Complete Set
Retails $5.05.

Rim Braces



R20—5/8"
R22—11/16"
R24—3/4"
R26—13/16"
R28—7/8"

All Sizes $1.25

This Knob Fits the Hand

SPEEDER BRACES
FOR SHOPS

All Sizes $1.00 Each

Our Complete Catalog No. 7—on Request

The Trade Discounts are Interesting.

GENERAL SALES AGENTS **J. H. FAW CO.** 27 Warren St. New York

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